UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A ++' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(25/Aug/Adp./50)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the syllabi and courses of studies for **Post Graduate Programme** in **Electronics** under **NEP-2020** as per details given below:-

Two Year Post Graduate Programme under NEP-2020

Subject	Semester	For the examinations to be held in the year
Electronics	Semester-I	December 2025, 2026 and 2027
	Semester-II	May 2026, 2027 and 2028
	Semester-III	December 2026, 2027 and 2028
	Semester-IV	May 2027, 2028 and 2029

One Year Post Graduate Programme under NEP-2020

Subject	Semester	For the examinations to be held in the year
Electronics	Semester-I	December 2026, 2027 and 2028
	Semester-II	May 2027, 2028 and 2029

The Syllabi of the courses are also available on the University website: www.jammuuniversity.ac.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/25/ 7799-7828
Dated: 29/8/2025
Copy for information and necessary action to:

1. Dean, Faculty of **Science**
2. Director/Convener, Board of Studies in **Electronics.**
3. Director, Centre for IT Enabled services and Management, University of Jammu for information and for uploading on University Website.
4. All members of the Board of Studies
5. Joint Registrar (Evaluation/P.G. Exam.)
6. Programmer, Computer Section, Examination Wing

21/8/25
Joint Registrar (Academic)

21/8/25 21/08/25

PG Syllabi 2025 (Two Year M.Sc. Electronics under NEP-2020; Total Credits : 102)
Programme Code-PGFSE006

S.No.	Course No.	Course Title	No. of credits	Credit Level	Credit Points	Course Type Core/ Elective/ Any Other	Marks		Nature of Course Global/ National/ Regional/ Skill	SAWAM/ MOOC	Vocational Course	Research Project/ Summer Internship/ Dissertation
							Theory	Practical				
Semester-I												
1	P2ELTC101	Network Analysis	4	6.5	26	Core	100	---	Global	---	---	---
2	P2ELTC102	Digital System Design	4	6.5	26	Core	100	---	Global	---	---	---
3	P2ELTC103	Electronic Materials and Semiconductor Devices	4	6.5	26	Core	100	---	Global	---	---	---
4	P2ELTC104	Computational Techniques in Electronics	4	6.5	26	Core	100	---	Skill	---	---	---
5	P2ELPC105	Lab course on Network Analysis	2	6.5	13	Core	---	50	Global	---	---	---
6	P2ELPC106	Lab course on Digital System Design	2	6.5	13	Core	---	50	Global	---	---	---
7	P2ELPC107	Lab course on Electronic Materials and Semiconductor Devices	2	6.5	13	Core	---	50	Global	---	---	---
8	P2ELPC108	Lab course on Computational Techniques in Electronics	2	6.5	13	Core	---	50	Skill	---	---	---
Total Credits = 24												
Semester-II												
9	P2ELTC201	Antennas and Microwave Devices	4	6.5	26	Core	100	---	Global	---	---	---
10	P2ELTC202	Advanced Analog Circuit Design	4	6.5	26	Core	100	---	Global	---	---	---
11	P2ELTC203	Embedded Systems Programming	4	6.5	26	Core	100	---	Skill	---	---	---
12	P2ELTC204	Advanced Microprocessors and Microcontroller	4	6.5	26	Core	100	---	Skill	---	---	---
13	P2ELPC205	Lab course on Antenna and Microwave Devices	2	6.5	13	Core	---	50	Global	---	---	---
14	P2ELPC206	Lab course on Advanced Analog Circuit Design	2	6.5	13	Core	---	50	Global	---	---	---
15	P2ELPC207	Lab course on Embedded Systems Programming	2	6.5	13	Core	---	50	Skill	---	---	---
16	P2ELPC208	Lab course on Microprocessors and Microcontrollers	2	6.5	13	Core	---	50	Skill	---	---	---

17	P2ELPC209	Industrial Training	2	6.5	13	Core	---	50	Skill	---	---	Summer Internship
18	P2ELVC251	Vocational Course	4	6.5	26	---	---	100	Skill	---	Yes	---
Total Credits = 26												
Semester-III												
19	P2ELTC301	Digital Signal Processing	4	6.5	26	Core	100	---	Global	---	---	---
20	P2ELTC302	Electronic Communication Systems	4	6.5	26	Core	100	---	Global	---	---	---
21	P2ELTC303	Industrial Electronics and Control systems	4	6.5	26	Core	100	---	Global	---	---	---
22	P2ELTC304	Device Fabrication Technology	4	6.5	26	Core	100	---	Global	-----	---	---
23	P2ELPC305	Lab course on Digital Signal Processing	2	6.5	13	Core	---	50	Global	---	---	---
24	P2ELPC306	Lab course on Electronic Communication Systems	2	6.5	13	Core	---	50	Global	---	---	---
25	P2ELPC307	Lab course on Industrial Electronics and Control systems	2	6.5	13	Core	---	50	Global	---	---	---
26	P2ELPC308	Seminar	2	6.5	13	Core	---	50	Global	---	---	---
27	P2ELMO351	MOOC/SWAYAM	4	---	---	Core	---	100	---	Swayam	----	---
Total Credits = 28												
Semester-IV												
28	P2ELTC401	Smart Sensors and Instrumentation Systems	4	6.5	26	Core	100	---	Global	---	---	---
29	P2ELTC402	Data Communication	4	6.5	26	Core	100	---	Global	---	---	---
30	P2ELRC403	Research	16	6.5	104	Core	---	400	Skill	---	---	Research Project and Dissertation
Total Credits = 24												

Program Specific Outcomes (PSOs): At the end of the two-year MSc Electronics program, the student will understand and be able to explain different branches of Electronics such as Network Analysis, Analog and Digital Circuit Design, Electronic Materials and Semiconductor Devices, Computational Techniques in Electronics, Microprocessors, Antennas and Microwave Devices, Digital Signal Processing, Electronic Communication Systems, Opto Electronics, Sensors and Instrumentation Systems, Industrial Electronics and Control Systems, Device Fabrication Technology and Data Communication besides hands on training on various laboratory courses. The student will be able to execute a short research project incorporating techniques of basic and advanced electronics under the supervision of faculty member. The student will be equipped to take up a suitable position in industry/academia.

Course Specific Outcomes (CSOs)

Semester 1

COURSE TITLE: Network Analysis
COURSE NO: P2ELTC101

At the end of the course, the students would be able to

- Learn basic circuital laws and network theorems for simplification of electrical networks.
- Perform time domain analysis of networks using differential equations and Laplace transform.
- Describe different types, configurations, two port network parameters and interrelations between them.
- Evaluate network functions and determine network stability.

COURSE TITLE: Digital System Design
COURSE NO: P2ELTC102

At the end of the course, the students would be able to

- Simplify Boolean expressions using K maps and design various combinational logic circuits.
- Design sequential logic circuits like synchronous/asynchronous counters and registers.
- Study different memories, their architecture, operation, and timing, its types and. Familiarize with PLDs, GAL and FPGA.
- Learn basics of VHDL programming like data types, operators, Behavior modelling, data flow modelling and structural modelling.

COURSE TITLE: Electronic Materials and Semiconductor Devices
COURSE NO: P2ELTC103

At the end of the course, the students would be able to

- Learn the carrier transport phenomenon in semiconductors.
- Describe the device physics of PN junction, Tunnel diode, BJT and MOSFET.
- Learn the behaviour of photonic devices like LEDs and solar cells.
- Learn the basic concepts and their application potential of advanced materials in Electronics.

COURSE TITLE: Advanced Microprocessor and Microcontroller
COURSE NO: P2ELTC204

At the end of the course, the students would be able to

- Understand the system design based on 8086 microprocessor and 8087 co-processor.
- Understand the programming and interfacing techniques of 8086 microprocessor.
- Analyze the basic concepts and programming of 8051 microcontroller.
- Understand the interfacing of 8086 and 8051 with various modules.

Semester-III

COURSE TITLE: Digital Signal Processing
COURSE NO: P2ELTC301

At the end of the course, the students would be able to

- Understand the principles of DSP.
- Understand the working of DSP processors.
- Understand discrete transforms and their applications.
- Design DSP processors based systems.

COURSE TITLE: Electronics Communication Systems
COURSE NO: P2ELTC302

At the end of the course, the students would be able to

- Understand different signals and operations performed on them.
- Describe the different techniques of analog modulation and demodulation.
- Understand the principles of digital modulation and demodulation.
- Understand information theory and coding techniques.

COURSE TITLE: Industrial Electronics and Control Systems
COURSE NO: P2ELTC303

At the end of the course, the students would be able to

- Understand various power semiconductor devices such as P-MOSFET, SCR, DIAC, TRIAC, GTO etc.
- Understand the basic principle of phase control, cycloconverter, buck converters, boost converters etc.
- Describe PWM inverters, HVDC system, static circuit breakers etc.
- Use standard test signals to identify performance characteristics of 1st and 2nd order systems.
- Apply Root locus, Nyquist and Bode plot stability criterion.

COURSE TITLE: Device Fabrication Technology
COURSE NO: P2ELTC304

At the end of the course, the students would be able to

- Understand the basics of IC fabrication.
- Understand the basics of lithography, etching, NEMS, MEMS etc.
- Have knowledge of various thin film deposition and characterization techniques.
- Know the fabrication of IC passive components, Memory devices and CMOS technology.

Semester-IV

COURSE TITLE: Smart Sensors and Instrumentation Systems
COURSE NO: P2ELTC401

At the end of the course, the students would be able to

- Understand the important transduces and sensors.
- Understand the working of biomedical instruments.
- Apply electronic principles for agriculture development.
- Sensors and networking principles to IoT based system design.

COURSE TITLE: Data Communication
COURSE NO: P2ELTC402

At the end of the course, the students would be able to

- Understand different Network topologies.
- Describe the principles of wireless and mobile communication.
- Understand the principle and techniques of optical communication.
- Describe the satellite communication techniques and Radar principle.

COURSE TITLE: Research
COURSE NO: P2ELRC403

- This course will equip students with practical skills, enhance problem-solving abilities and foster research-based learning.
- Students will develop the ability to apply theoretical knowledge to real world problems besides analyzing, designing and implementing solutions.
- Students will gain experience in teamwork, communication and project management.

Two Year P. G. Syllabi in the subject of Electronics under NEP 2020
(M. Sc. Electronics 1st Semester)

Two Year P. G. Syllabi in the subject of Electronics, **M. Sc. Electronics, Semester-I** under NEP 2020 for the examinations to be held in the years mentioned below:

Semester-I: Validity December 2025, 2026 and 2027			
Course Title		**Course Code**	**Credits**
1. Network Analysis	(4 Credits)	P2ELTC101	**24**
2. Digital System Design	(4 Credits)	P2ELTC102	
3. Electronic Materials and Semiconductor Devices	(4 Credits)	P2ELTC103	
4. Computational Techniques in Electronics	(4 Credits)	P2ELTC104	
5. Lab course on Network Analysis	(2 Credits)	P2ELPC105	
6. Lab course on Digital System Design	(2 Credits)	P2ELPC106	
7. Lab course on Electronic Materials and Semiconductor Devices	(2 Credits)	P2ELPC107	
8. Lab course on Computational Techniques in Electronics	(2 Credits)	P2ELPC108	

M. Sc. Electronics
I[st] Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELTC101

Course No: P2ELTC101 (Core Course)
Title: **Network Analysis**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2025, 2026 and 2027 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives

To equip the students with rigorous theoretical and practical knowledge to analyze electrical networks.

Course Outcomes

At the end of the course, the students would be able to

- Learn basic circuital laws and network theorems for simplification of electrical networks.
- Perform time domain analysis of networks using differential equations and Laplace transform.
- Describe different types, configurations, two port network parameters and interrelations between them.
- Evaluate network functions and determine network stability.

Unit I Network Theorems

Nodal and Mesh analysis; Star-delta transformation; Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Millman's theorem, Reciprocity theorem, Compensation theorem, AC circuit analysis; Numerical problems.

Unit II Graph theory and Time Domain Analysis of Networks

Graph Theory: Network Graph, Tree, Link branches, Tie and Cut set matrices, Duality and Dual networks; Time domain analysis of linear circuits: RL, RC, and RLC circuits; Differential equation approach (first, second and higher order differential equations), Initial conditions in networks; Laplace transformation, Properties of Laplace transforms, Partial fraction expansion, Heaviside's expansion theorem, State variable analysis: State variable approach, state space representation, transfer function.

Unit III Two Port Network Parameters

Network elements; Classification of networks; Network configurations; Impedance parameters; Admittance parameters; Transmission parameters; Inverse transmission parameters; Hybrid and Inverse hybrid parameters; Interrelation of different parameters; Interconnection of two port networks.

Unit IV Network Functions

Network functions of one and two port networks, Poles and Zeros of network function, Restrictions on poles and zero locations for driving-point functions and transfer function, Time domain behavior from pole and zero plot, Routh-Hurwitz's criterion of stability.

M. Sc. Electronics
1st Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELTC102

Course No: P2ELTC102 (Core Course)
Title: **Digital System Design**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2025, 2026 and 2027 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives

The course offers students to learn how to minimize the Boolean expression by using K maps, designing of combinational and sequential logic circuits, learn different types of memories and their architecture. Also course explains concepts PLDs, PAL, GAL, FPGA and VHDL programming language.

Course Outcomes

At the end of the course, students would be able to

- Simplify Boolean expressions using K maps and design various combinational logic circuits.
- Design sequential logic circuits like synchronous/asynchronous counters and registers.
- Study different memories, their architecture, operation, and timing, its types and. Familiarize with PLDs, GAL and FPGA.
- Learn basics of VHDL programming like data types, operators, Behavior modelling, data flow modelling and structural modelling.

Unit I Combinational Logic Design

Canonical and Standard forms, Karanaugh Map: SOP & POS minimization, Five variable K-maps; Binary Adder, Carry look ahead Adder, 4-bit Adder-Subtractor, Comparator: 2 bit, 3 bit, 4 bit and higher comparators, Decoder: Basic binary decoder,4-bit decoder, BCD to Decimal decoder, BCD to seven segment decoder; Encoder: Decimal to BCD encoder, 8:3 encoder, Priority encoder; Multiplexer: 2:1, 4:1, 8:1 and logic function generator, Demultiplexer.

Unit II Sequential Logic Design

Review of Flip-flop; Asynchronous counter: Two bit, Three bit, Decade and Four bit counters, Synchronous counter: Two bit, Three bit, Decade and Four bit counters; Up/Down synchronous counters; Design of synchronous counters; Construction of State Diagrams; Shift registers: Basic function, SISO,SIPO, PISO,PIPO, Bidirectional; Johnson and Ring counters.

Unit III Memory and Programmable Logic

General Memory Operation; CPU-Memory Connections; ROM: Architecture, Timing diagram, Types: MROM PROM, EPROM, EEPROM, Flash Memory; RAM: Architecture & Operation of SRAM, DRAM; Memory Expansion; Introduction to Programmable Logic Devices (PLDs): PLA, PAL, GAL, CPLD, FPGA.

Unit IV Introduction to VHDL

Introduction to VHDL, Identifiers, Data objects, Data types, Operators, Types of delays, Behavior Modeling: Entity declaration, Architecture body, Process statement; Dataflow modeling: Concurrent signal assignment statement, Concurrent versus sequential assignment statement; Structural modeling: Component declaration, component instantiation; Sub-programs and overloading, Generics.

M. Sc. Electronics
1st Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELTC103

Course No: P2ELTC103 (Core Course)
Title: **Electronic Materials and Semiconductor Devices**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2025, 2026 and 2027 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives
To provide basic knowledge and concepts of advanced semiconductor devices and materials.

Course Outcomes
At the end of the course, student would be able to

- Learn the carrier transport phenomenon in semiconductors.
- Describe the device physics of PN junction, Tunnel diode, CCD, BJT and MOSFET.
- Learn the behaviour of devices such as LEDs, solar cells, CNTs, Graphene, ZnO, SiC etc.
- Learn the basic concepts and application potential of advanced materials in Electronics.

UNIT I Carrier Concentration & Transport

Semiconductor materials; Energy bands; intrinsic carrier concentration; donors and acceptors; carrier drift: mobility, resistivity; Hall Effect; carrier diffusion: diffusion process, Einstein relation, current density equations; generation & recombination processes: direct, indirect, continuity equation; high field effects.

UNIT II P-N Junction

Thermal equilibrium condition: band diagram, equilibrium Fermi levels, space charge; depletion region: abrupt junction; depletion capacitance: C-V characteristics, Varactor; I-V characteristics: ideal characteristics, high-injection and temperature effects; diffusion capacitance, junction breakdown: tunneling effect, avalanche multiplication, Tunnel diode and its characteristics; Charge coupled devices (CCD): Structure, charge storage and transfer.

UNIT III Bipolar Transistor & MOSFET

Transistor action: operation in active mode, current gain; static characteristics of bipolar transistor: modes of operation, I-V characteristics of CE configuration; frequency response of bipolar transistor; Basic HBT and HEMT structures, MOS diode: Ideal MOS diode; surface depletion region and ideal MOS curves; Sio_2 – Si MOS diode, interface traps and oxide charges; MOSFET fundamentals: basic characteristics, NMOS & CMOS inverters.

UNIT IV Photonic Devices & Advanced Materials

Radiative transitions and optical absorption; light emitting diodes: visible and infrared LEDs; semiconductor LASERS: semiconductor materials, structure and operation; Photo detectors: photoconductor, photodiodes; Solar cell: PN junction solar: IV characteristics, Fill factor and conversion efficiency; Polymers: introduction, classification; Flexible display devices; Emerging materials for future devices: Graphene, CNT, ZnO, SiC; Concepts of quantum well, quantum wire and quantum dots.

M. Sc. Electronics
1st Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELTC104

Course No: P2ELTC104 (Core Course)
Title: **Computational Techniques in Electronics**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2025, 2026 and 2027 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives

The course is intended to aware the students about various computational techniques used to model physical and electronic systems. The course also provides in-depth coverage to MATLAB and its applications.

Course Outcomes

At the end of the course, students should be able to

- Learn complex variable functions, integral theorems and infinite series.
- Obtain the numerical solutions of non-linear equations using Bisection, Newton-Raphson and Secant methods.
- Obtain the numerical solutions of linear equations using Gauss elimination, Gauss Jordan method, Gauss-Seidal and Jacobi iteration methods.
- Obtain the numerical solutions of differential equations using Euler's and Runga-Kutta method.
- Learn basics of MATLAB and its applications to solve linear equations, differential equations, find eigen values and plotting 2D & 3D plots.

Unit I Error and Complex Analysis

Accuracy and precision; Truncation and round-off errors; Sources of Errors, Error propagation, sensitivity and conditioning, stability and accuracy, floating-point arithmetic and round-off error. Complex Analysis: Analytic function, Cauchy-Riemann equations; Cauchy integral theorem; Cauchy integral formula, Taylor's series, Laurent's series; Cauchy residual theorem.

Unit II Numerical Methods

Solution of non linear equations: Bisection, Newton-Raphson and Secant method; Solution of system of linear equations: Gauss elimination, Gauss Jordan method; Gauss-Seidal iteration method, Jacobi iteration, Matrix eigen value problems. Interpolation: Lagrange and Newton's Forward and backward difference formulae; Numerical solutions of differential equations: Euler's method and Runga-Kutta method (IInd Order).

Unit III Basics of MATLAB

Introduction to MATLAB, Matrices and Vectors: Input, Indexing, Matrix manipulations, Creating vectors; Matrics and Array operations: Arithmatic operations, Relational operations, Logical operations, Eementary math functions, Matrix functions, Character strings, Vectorization, Plotting simple graphs, Script and functions: script and function files, Executing the function, Global variables; Loops branches and control flow, Interactive input, Advanced data objects: multidimensional matrices, structures, cells.

M. Sc. Electronics
I[st] Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELPC105

Course No: P2ELPC105 (Core Course)
Title: **Lab course on Network Analysis**
Credits: 2
Semester Exam: 25
Validity: December 2025, 2026, and 2027 Exams

Duration of Examination: 2 Hours
Max. Marks: 50

Sessional Assessment: 25

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. To verify Thevenin and Norton theorems.
2. To verify Superposition theorem.
3. To verify Maximum power transfer theorem.
4. To find the network parameters of two port network.
5. To analyse simple resistive circuits using PSpice.
6. To analyse a resistive circuit to obtain dc operating point, small signal transfer function and dc sweep.
7. To find the Thevenin equivalent circuit using transfer function analysis.
8. To obtain the transient response of an RL circuit using PSpice.
9. To obtain the transient response of an RC circuit using PSpice.
10. To obtain the transient response of an RLC circuit using PSpice.

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
<tr><td>Mid Term appraisal</td><td>2 hours</td><td colspan="3">25% (12.5)</td></tr>
<tr><td rowspan="2">External Examination</td><td rowspan="2">2 hours</td><td rowspan="2">75% (37.5)</td><td>50% (25)</td><td>Project report</td></tr>
<tr><td>25% (12.5)</td><td>Viva-Voce</td></tr>
<tr><td colspan="2">Total</td><td colspan="3">50</td></tr>
</table>

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
I[st] Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELPC106

Course No: P2ELPC106 (Core Course)
Title: **Lab course on Digital System Design**
Credits: 2
Semester Exam: 25
Validity: December 2025, 2026 and 2027 Exams

Duration of Examination: 2 Hours

Max. Marks: 50
Sessional Assessment: 25

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Design of Adder and Subtractor circuits
2. Design of Multiplexer and Demultiplexers
3. Design of Encoders
4. Design of Decoders
5. Design of Registers
6. Design of Counters
7. Programming of memory units
8. Digital circuit design by using PLDs
9. Design of digital circuits using FPGA
10. VHDL programming

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
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M. Sc. Electronics
I[st] Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELPC107

Course No: P2ELPC107 (Core Course) Duration of Examination: 2 Hours
Title: **Lab course on Electronic Materials & Semiconductor Devices**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: December 2025, 2026, and 2027 Exams

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Calculation of barrier height and ideality factor at room temperature (for Si and GaAs devices) from the I-V characteristics of the PN junction diode.
2. Calculation of diode parameters at varying frequency from the *C-V* characteristics.
3. Calculation of semiconductor conductivity type and carrier concentration using Hall Effect.
4. Calculation of semiconductor resistivity and band gap using Four-Probe method.
5. Calculation of carrier mobility and drift velocity using an experimental setup.
6. BJT characteristics.
7. FET & MOSFET characteristics
8. I-V characteristics of Tunnel diode
9. I-V characteristics of LED.
10. I-V characteristics of Photodiode.
11. I-V characteristics of LDR.
12. I-V characteristics of Solar cell.

Scheme of Examination

<table>
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<tr><td>Mid Term appraisal</td><td>2 hours</td><td colspan="3">25% (12.5)</td></tr>
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M. Sc. Electronics
I[st] Semester (NEP 2020)
(for the examinations to be held in the years 2025, 2026 and 2027)
Course No: P2ELPC108

Course No: P2ELPC108 (Core Course) Duration of Examination: 2 Hours
Title: **Lab course on Computational Techniques in Electronics**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: December 2025, 2026, and 2027 Exams

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. To create and work with array of numbers using MATLAB.
2. To create and save simple plots using MATLAB.
3. To find the determinant of a matrix using MATLAB.
4. To find the eigen values and eigen vectors using MATLAB
5. To find the solution of first order linear ordinary differential equations using MATLAB.
6. To find the solution of second order non-linear ordinary differential equations using MATLAB.
7. To solve linear system of equations using Gauss Elimination method using MATLAB.
8. To find the roots of a polynomial using MATLAB.
9. To save and print 2D plots using MATLAB.
10. To save and print 3D plots using MATLAB.

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
<tr><td>Mid Term appraisal</td><td>2 hours</td><td colspan="3">25% (12.5)</td></tr>
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<tr><td>25% (12.5)</td><td>Viva-Voce</td></tr>
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</table>

External Practical/ Research (thesis/project/patent) examination

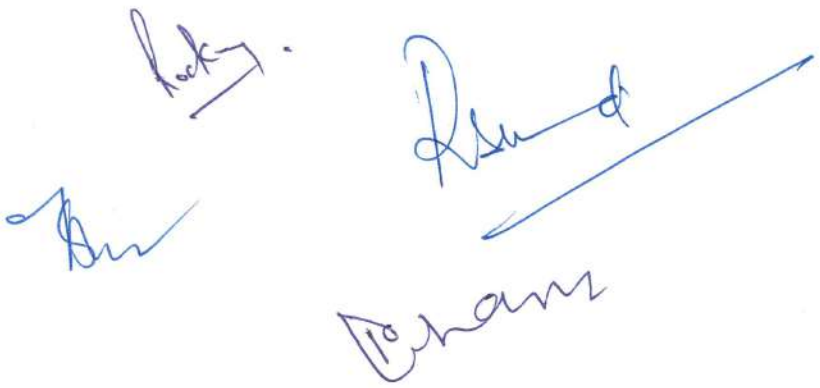
External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

Two Year P. G. Syllabi in the subject of Electronics under NEP 2020
(M. Sc. Electronics 2nd Semester)

Two Year P. G. Syllabi in the subject of Electronics, **M. Sc. Electronics, Semester-II** under NEP 2020 for the examinations to be held in the years mentioned below:

Semester-II: Validity May 2026, 2027 and 2028			
	Course Title	**Course Code**	**Credits**
1.	Antennas and Microwave Devices (4 Credits)	P2ELTC201	26
2.	Advanced Analog Circuit Design (4 Credits)	P2ELTC202	
3.	Embedded Systems Programming (4 Credits)	P2ELTC203	
4.	Advance Microprocessors and Microcontroller (4 Credits)	P2ELTC204	
5.	Lab course on Antennas and Microwave Devices (2 Credits)	P2ELPC205	
6.	Lab course on Advanced Analog Circuit Design (2 Credits)	P2ELPC206	
7.	Lab course on Embedded Systems Programming (2 Credits)	P2ELPC207	
8.	Lab course on Microprocessors and Microcontrollers (2 Credits)	P2ELPC208	
9.	Industrial Training (2 Credits)	P2ELPC209	
10.	Vocational Course* (4 Credits)	P2ELVC251	

*For students opting to exit after 1 year with P.G. Diploma in lieu of Industrial training



M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC201

Course No: P2ELTC201 (Core Course)
Title: **Antennas and Microwave Devices**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives

To equip the students with the principles of transmission, transmission media and microwave devices.

Course Outcomes

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

- Understand Maxwell's equations and wave propagation through different media.
- Describe the principles of transmission lines and waveguides.
- Understand the radiation through different antennas.
- Understand the basic principles of microwave devices.

Unit I Maxwell's Equations

Introduction: vector calculus, Basic laws of electrostatics and magnetostatics; Maxwell's equations in point and integral forms and their Interpretations; Magnetic potentials; Retarded potentials; Wave propagation in lossy dielectrics; Plane waves in lossless dielectrics, free space and good conductors; Skin effect; Power and Poynting vector.

Unit II Transmission Lines and Wave Guides

Transmission line parameters; Transmission line equations; Characteristics impedance; Input impedance, Reflection coefficient, Standing wave ratio and Power; Smith chart: properties and applications; Applications of transmission lines. Rectangular waveguides; Transverse electric and magnetic modes; Wave propagation in the guide; attenuation in waveguide.

Unit III Antennas

Radiation mechanism; Hertzian dipole; Radiation resistance; Half wave dipole and Quarter wave monopole antenna; Folded dipole; Antenna characteristics: Antenna patterns; Radiation intensity, Directive gain, Directivity and Power gain; Effective aperture; Antenna arrays: Broadside and Endfire arrays; Pattern multiplication; Effective area and Friis equation; Yagi-Uda Antenna; Helical antenna; Frequency independent antennas; Reflector and lens antennas; Horn antennas; Microstrip antenna.

Unit IV Microwave Devices

Introduction: Microwave frequencies, Limitations of conventional vacuum tubes, Reflex Klystron: Reentrant cavities, Velocity modulation, Bunching process, output power; Multicavity klystron amplifiers; Traveling wave tubes: Slow wave structures, Amplification process; Magnetron oscillator, Forward wave crossed field amplifier, Backward wave cross field amplifier and oscillator; Microwave diodes: tunnel diode; GUNN diode; IMPATT Diode.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC202

Course No: P2ELTC202
Title: **Advanced Analog Circuit Design**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives
To acquaint the students with the principles of CMOS circuits, Operational amplifiers and Active filters.

Course Outcomes
At the end of the course the students should be able to
- Understand Modelling of CMOS devices and operation of basic circuits.
- Describe the different topologies of CMOS amplifiers.
- Understand the different configurations and applications of operational amplifiers.
- Understand the basic principles of Active filters.

UNIT I CMOS Modelling and Circuits

Simple MOS large and small signal models; Subthreshold MOS model
Analog CMOS Subcircuits: MOS Switch, MOS Diode/Active Resistor; Current Sink and sources, Cascode Stage: Cascode as current source and amplifier, Current mirror: Basic structure, Non-ideal effects, Wilson current mirror and its modification, Problems

UNIT II CMOS Amplifiers

MOS amplifier topologies; Biasing; Realization of current sources; Common source stage: CS core, CS stage with current source load, CS stage with diode connected load, CS stage with degeneration; CS core with biasing; Common gate stage: CG stage with biasing; Source follower: Source follower core, source follower with biasing; Differential amplifier: Large signal and small signal analysis; Cascode differential amplifier, Differential pair with active load, Frequency response of amplifiers, Bode rules, Millers theorem; High frequency model of MOSFET and transient frequency, Problems.

UNIT III Operational Amplifiers

General considerations, Op-amp based circuits: Non-inverting amplifier, inverting amplifier, Integrator, Differentiator, Voltage adder, Precision Rectifiers; Logarithmic Amplifiers; Square root amplifier; Op-amp non-idealities: DC offsets, input bias current, speed limitations, finite input and output impedance; Differential and Instrumentation amplifier, Comparators; Schmitt Trigger; Clippers; Clampers; Peak Detector; Sample and Hold circuit.

UNIT IV Active Filters

Filters: Characteristics, Classification, Transfer function & Sensitivity function; First order and Second order filters; RLC Realizations; Active Filters: Sallen and Key filter, Integrator based biquads, Biquads using simulated inductors; Approximation of Filter response: Butterworth response, Chebyshev response.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC203

Course No: P2ELTC203 (Core Course)
Title: **Embedded Systems Programming**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives
To equip the students with skills of problem solving in Embedded systems and Python language.

Course Outcomes
At the end of the course the students should be able to

- Learn Problem solving strategies and data structures.
- Develop programming skills for embedded systems.
- Learn basic elements of python programming
- Implement object oriented programming in python.
- Evaluate network functions and determine network stability.

UNIT I Problem Solving Strategies and Data structures

Problem Analysis; Algorithms: Complexity, time space trade off ; Flow charts; Overview of programming Languages; Data structures; Data structure operations; Arrays: Linear arrays, representation, traversing, inserting and deleting; Sorting: Bubble sort, selection sort insertion sort, merge sort; searching: Linear and binary; Linked List: representation, traversing, inserting and deleting; Stacks: Array representation of stack; Arithmetic expressions, Quick sort, Queues; Trees: Binary trees, representing binary trees in memory, traversing binary tree.

UNIT II Embedded C

Introduction: Embedded Systems, Processor for embedded systems, programming language; Example of embedded program; compiling, linking and locating; Reading switches: basic techniques for reading from port pins, examples; Adding structure to code: OOPs with C, Project and port header; Meeting real time constraints: creating hardware delays; Variables in embedded C ; Logical and bit wise operations; Introduction to Rasberry Pie.

UNIT III Basics of Python

Python Overview; Getting started with Python; Python Identifiers; Reserved Keywords; Variables; Standard Data Types: Numeric, String, List, Tuple, Dictionary, Boolean, Sets; Operators: Arithmetic, Comparison, Assignment, Logical, Bitwise, Membership, Identity; Statement and Expressions; Strings Operations; Boolean Expressions; Control Statements: for loop, while loop, if elif else statements; Input from Keyboard; Functions: Built-in Function, Composition of functions, user defined Functions, Parameters and Arguments, Function Calls, The return Statement, Python Recursive Functions; The Anonymous Functions.

UNIT IV Object Oriented Programming with Python

Overview of Object-Oriented Programming); Classes: Defining classes, creating objects, methods; objects as arguments; objects as return values; Built-in Class Attributes; Inheritance: Types, Multiple and multilevel inheritance; Method Overriding; Operator overloading; Data Encapsulation; Data Hiding.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC204

Course No: P2ELTC204 (Core Course)
Title: **Advanced Microprocessor and Microcontroller**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course objectives

The key objective of this course is to develop an understanding of the operations of various microprocessors and microcontrollers; assembly language programming and interfacing techniques.

Course Outcomes

At the end of the course students should be able to

- Understand the system design based on 8086 microprocessor and 8087 co-processor.
- Understand the programming and interfacing techniques of 8086 microprocessor.
- Analyze the basic concepts and programming of 8051 microcontroller.
- Understand the interfacing of 8086 and 8051 with various modules.

UNIT I **16-bit microprocessors**

8086 internal architectures, memory organization; 8086 basic configurations: minimum mode, maximum mode; internal architecture and interfacing of 8284 clock generator & 8288 bus controller with 8086; system bus timings for minimum and maximum modes; 8086 Interrupts; introduction to 8087 co-processor and advance 8086 architectures; concepts of multicore processors.

UNIT II **Programming and Interfacing of 8086**

8086 addressing modes, Instruction formats; special one-bit indicators; instruction set: data transfer instructions, arithmetic instructions: binary, packed and unpacked arithmetic; branch instructions, loop instructions, flag manipulation instructions, shift and rotate instructions, byte and string instructions; interfacing memories: I/O mapped I/O and memory mapped I/O; I/O operations: programmed I/O and interrupt driven I/O; interfacing of 8255 and 8253 with 8086 microprocessor; assembly language programs.

UNIT III **8051 Microcontroller and Programming**

8051 internal architecture: special function registers, flags, and PSW; internal RAM; I/O ports; external memory; 8051 interrupts; counters and timers; serial data input/output; instruction set: logical operations- byte and bit level logical operations, rotate and swap operations; arithmetic operations: flags, multiplication and division, decimal arithmetic; Jump and call instructions: calls and subroutines, interrupts and returns; programming examples.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC205

Course No: P2ELPC205 (Core Course)
Title: **Lab course on Antenna and Microwave Devices**
Credits: 2
Semester Exam: 25
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2 Hours
Max. Marks: 50
Sessional Assessment: 25

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Study of simple Dipole antenna.
2. Study of variation in radiation strength at a given distance from antenna.
3. Study of Folded half wave dipole antenna.
4. Study of Yagi-Uda three element folded antenna.
5. Study of V-I characteristics of GUNN Diode.
6. Study of V-I characteristics of Tunnel Diode.
7. To determine the standing wave ratio and reflection coefficient.
8. Measurement of dielectric constant.
9. Study of Helix antenna.
10. To measure an unknown impedance with Smith Chart.

Scheme of Examination

MCQ on LMS + Subjective Test	Time allotted for the examination	%Weightage (Marks)		
Mid Term appraisal	2 hours	25% (12.5)		
External Examination	2 hours	75% (37.5)	50% (25)	Project report
			25% (12.5)	Viva-Voce
Total		50		

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC206

Course No: P2ELPC206 (Core Course)
Title: **Lab course on Advanced Analog Circuit Design**
Credits: 2
Semester Exam: 25
Validity: May 2026, 2027 and 2028 Exams

Duration of Examination: 2 Hours

Max. Marks: 50
Sessional Assessment: 25

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Design and simulation of current mirrors using PSpice.
2. Design and simulation of CMOS amplifiers using PSpice.
3. Design and verification of operational amplifier based inverting amplifier.
4. Design and verification of operational amplifier based non-inverting amplifier.
5. Design and verification of differential and instrumentation amplifier.
6. Design and verification of adder and subtractor.
7. Design and verification integrator and differentiator.
8. Design and verification of first order active low pass and high pass filters.
9. Design and verification of second order active low pass and high pass filters.
10. Design and verification of switched capacitor filters.

Scheme of Examination

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M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC207

Course No: P2ELPC207 (Core Course) Duration of Examination: 2 Hours
Title: **Lab course on Embedded Systems Programming**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: May 2026, 2027 and 2028 Exams

Each student has to perform a total of six experiments using MATLAB/PYTHON/Embedded-C/Cross-compiler. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. To find average of three numbers.
2. To generate a sine wave of a given frequency and amplitude.
3. To add sine waves of different frequencies and amplitudes.
4. To generate a modulating signal using a sine waves.
5. To demodulate a given a signal.
6. To make a simple program for blinking a LED on Arduino board.
7. To study serial communication between a pc and Arduino.
8. To make a program for automatic switching of a bulb using a LDR.
9. To switch the output bulb in accordance with the input switch.
10. To interface a LCD with Arduino.
11. To program a ESP8266 for remotely controlling a bulb.
12. To use ESP8266 for data logging.

Scheme of Examination

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</table>

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC208

Course No: P2ELPC208 (Core Course) Duration of Examination: 02 Hours
Title: **Lab course on Microprocessors and Microcontrollers**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: May 2026, 2027 and 2028 Exams

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Simple programs with 8086.
2. Implementation of bubble sorting.
3. Implementation of searching with 8086.
4. Interfacing with 8086 (Logic Controller).
5. Interfacing with 8086 (Traffic Light Controller).
6. Interfacing using A/D Converter with 8086/8051.
7. Assembly language programming using 8051 microcontroller.
8. Interfacing of various modules with 8051 microcontroller.

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
<tr><td>Mid Term appraisal</td><td>2 hours</td><td colspan="3">25% (12.5)</td></tr>
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<tr><td colspan="2">Total</td><td colspan="3">50</td></tr>
</table>

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC209

Course No: P2ELPC209
Title: **Industrial Training**
Credits: 2 Max. Marks: 50
Validity: May 2026, 2027 and 2028 Exams

Course Objectives

This course aims to impart practical skills and training at Industries/Research Institutes/Training Centers so that the students can have better exposure in the relevant field and are able to fulfil the industry needs. This training would enable the students to build careers in start-up industry, research and development.

Course Scheme

The students are required to undertake an industrial training at Industries/Research Institutes/Training Centers as decided by Departmental Affairs Committee. The industrial training is to be undertaken by each student at designated place for duration of 4 to 6 weeks during the summer vacations falling between 2nd and 3rd semesters. The certificate of the successful completion of industrial training of the required duration shall be submitted to the department by the candidates along with the training report. The candidates will be required to present seminar based on the work done during the training period.

Course Outcomes

- This course will provide practical and industry-relevant skills supplementing theoretical knowledge.
- It will equip students with the ability to design and analyze circuits, understand electronics devices and systems etc.
- It will enable the students to bridge the gap between academics and industry needs for employability.

Scheme of Examination

The students shall be examined internally by Board of Examiners consisting of Head of the Department and other faculty members with following details:

Training report: 25 marks Seminar based on the industrial training: 25 marks

M. Sc. Electronics
2nd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELVC251

Course No: P2ELVC251 Duration: 8 Weeks
Title: **Vocational Course**
Credits: 4 Max. Marks: 100
Validity: May 2026, 2027 and 2028 Exams

Course Objectives

This course aims to impart practical skills and training at Industries/Research Institutes/Training Centers so that the students can have better exposure in the relevant field and are able to generate employability.

Course Scheme

This course is meant for those students who intent to exit after first year (after Semester-II) of the 02 year PG programme and desire to get diploma of completion of first year. They need to obtain additional 04 credits from work based vocational course during summer break after 2nd semester of 8 weeks duration. The vocational course should be based on emerging trends, modern day techniques and demands of the society having employability factor.

Course Outcomes

- This course would provide hands-on training and industry-relevant skills, supplementing theoretical knowledge.
- Training at Industries/Research Institutes/Training Center would generate employability and livelihood.

Scheme of Examination

The students shall be examined internally by Board of Examiners consisting of Head of the Department and other faculty members with following details:

Training/Project report: 50 marks Viva voce examination after presentation: 50 marks

Two Year P. G. Syllabi in the subject of Electronics under NEP 2020
(M. Sc. Electronics 3rd Semester)

Two Year P. G. Syllabi in the subject of Electronics, **M. Sc. Electronics, Semester-III** under NEP 2020 for the examinations to be held in the years mentioned below:

Semester-III: Validity December 2026, 2027 and 2028			
Course Title		**Course Code**	**Credits**
1. Digital Signal Processing	(4 Credits)	P2ELTC301	
2. Electronic Communication Systems	(4 Credits)	P2ELTC302	
3. Industrial Electronics and Control systems	(4 Credits)	P2ELTC303	
4. Device Fabrication Technology	(4 Credits)	P2ELTC304	
5. Lab course on Digital Signal Processing	(2 Credits)	P2ELPC305	**28**
6. Lab course on Electronic Communication Systems	(2 Credits)	P2ELPC306	
7. Lab course on Industrial Electronics and Control systems	(2 Credits)	P2ELPC307	
8. Seminar	(2 Credits)	P2ELPC308	
9. MOOC/SWAYAM	(4 Credits)	P2ELMO351	

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC301

Course No: P2ELTC301 (Core Course)
Title: **Digital Signal Processing**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives
Understanding of basic principles of digital signal processing and DSP processors based implementation of industrial systems.

Course Outcomes
At the end of the course the students should be able to

- Understand the principles of DSP
- Understand the working of DSP processors
- Understand discrete transforms and their applications
- Design DSP processors based systems

UNIT I Introduction
Elements of digital signal processing; advantages of digital over analog signal processing; discrete time signals as array of values; standard discrete time signals; classification of discrete time signals; discrete time systems; classifications of discrete time systems; linear time invariant systems; difference equations; correlation; A/D conversion process.

UNIT II Discrete transforms
DFT, IDFT, and their properties; Radix-2 DIT FFT algorithm; Radix-2 DIF FFT algorithm; circular convolution; Z transform; properties of Z transform; inverse Z transform; system function and pole zero plots from Z transform; causality and stability in terms of Z transform; computation of Z transform; computation of coefficients of a difference equation from pole zeros; linear convolution using Z transform; relationship between Fourier transform and Z transform; Goertzel algorithm; chirp-Z transform.

UNIT III Filter design
Comparison of analog and digital filters; examples of FIR and IIR filters; ideal filter characteristics; realization of ideal filters; IIR filter design by approximation of derivatives; IIR filter design by impulse invariance; inherent stability of FIR filters; symmetric and antisymmetric FIR filters; linear phase in FIR filters; FIR filter design using windowing; FIR filter design using frequency sampling; FIR differentiators; design of Hilbert transformers; filter design using pole-zero placement.

UNIT IV DSP processors and applications
Commercial digital processing devices; architecture of TMS32OC54xx; on-chip peripherals; interrupts of TMS32OC54XX; data addressing modes of TMS32OC54xx; memory space of TMS32OC54xx processors; program control, instructions and programming; pipeline operation of TMS32OC54xx; serial interface; external bus interfacing signals; memory interface; parallel I/O interface; programmed I/O; direct memory access (DMA); CODEC interface circuit; DSP based bio-telemetry receiver; speech processing system; image processing system.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC302

Course Code: P2ELTC302 (Coree Course)
Title: **Electronic Communication Systems**
Credits: 4
Test I & Test II: 40
Validity: December 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60

Course Objectives

To acquaint the students with different signals and their operations, analog and digital modulation techniques, information theory and coding techniques.

Course Outcomes

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

- Understand different signals and operations performed on them.
- Describe the different techniques of analog modulation and demodulation.
- Understand the principles of digital modulation and demodulation.
- Understand information theory and coding techniques.

UNIT I Signals and Systems

Signals: Classification, Singularity functions: Step, Impulse & Ramp, Fourier transform and its properties; FT of periodic signals; Convolution; Energy and Power signals, Parseval's theorem for energy and power signals, Energy and power spectral densities, Correlation and Autocorrelation, Random variables: Discrete, continuous & their probability density functions; Noise, Noise temperature and Noise figure.

UNIT II Analog Modulation

AM and its spectrum, generation by square law modulation; AM demodulation by square law demodulator and envelope detector; DSBSC: Spectrum, Generation (Balanced modulator) Detection (Synchronous detection); SSB modulation; Generation by frequency discriminator & phase discriminator methods and Synchronous detection; VSB: Generation, Detection.

Time and Frequency-Division Multiplexing.

Angle modulation: Phase and FM; NBFM; WBFM; Generation of FM by Direct and Indirect method, FM discriminator.

UNIT III Digital Modulation

Sampling Theorem, Natural and Flat-top sampling; PAM & PTM, PCM: Quantization and BW; Companding; Differential PCM; Delta modulation; Adaptive delta modulation; Shift keying: ASK, FSK, PSK, and QPSK with generation and reception.

UNIT IV Information Theory and Coding

Basic concepts of information theory; Information measure; Entropy; Information rate; Discrete memory less channel, Channel types; Joint and Conditional entropy; Mutual information; Channel capacity; Shannon's Theorem; Shannon-Hartley Theorem; Trade-off between S/N and BW; Coding: Source coding, Entropy coding & Channel coding; Error detection and correction.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC303

Course No: P2ELTC303 (Core Course)
Title: **Industrial Electronics and Control systems**
Credits: 4
Test I & Test II: 40 Marks
Validity: December 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course objectives

To impart knowledge on various power semiconductor devices, SMPS, converters, inverters along with their applications. It further aims to provide the basic concepts of control systems.

Course Outcomes

At the end of the course students should be able

- To understand various power semiconductor devices such as P-MOSFET, SCR, DIAC, TRIAC, GTO etc.
- To understand the basic principle of phase control, cycloconverter, buck converters, boost converters etc.
- To describe PWM inverters, HVDC system, static circuit breakers etc.
- To use standard test signals to identify performance characteristics of 1st and 2nd order systems.
- To apply Root locus, Nyquist and Bode plot stability criterion.

Unit I Power Semiconductor Devices

Power diode: basic structure, characteristics and types; power transistor: steady-state characteristics; power MOSFET: P-MOSFET characteristics and applications, comparison of P-MOSFET with BJT; IGBT: basic structure, equivalent circuit, working, latch-up, characteristics, applications and comparison with MOSFET; Thyristors: characteristics, thyristor turn-on methods, two-transistor model of thyristor, introduction to PUT, SUS, SCS, DIAC, TRIAC and GTO.

Unit II Converters

Phase controlled rectifiers: principle of phase control, single phase half-wave circuit with RL load, single phase half-wave circuit with RL load and free-wheeling diode; single phase full-wave converters: mid-point and bridge converters; choppers: principle of chopper operation, step up choppers, types of choppers (A, B, C and D); Buck converters, Boost converters, Derived converters.

Unit III SMPS and Inverters

Switched mode power supply (SMPS): flyback, push-pull, half-bridge and full bridge converters; uninterrupted power supplies (UPS); inverters: single phase bridge inverters, voltage control in single phase inverter, pulse width modulated (PWM) inverters, principle of cycloconverter operation; high voltage DC transmission (HVDC): types of HVDC link, bipolar HVDC system, control of HVDC converters; static switches: single phase AC switches and DC switches; static circuit breakers: ac and dc circuit breakers.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELTC 304

Course No: P2ELTC304 (Core Course)
Title: **Device Fabrication Technology**
Credits: 4
Test I & Test II: 40 (20+20)
Validity: Dec 2026, 2027 and 2028 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 marks

Course objectives
This course is designed to provide a deep understanding of IC fabrication technology, various thin film deposition and characterization techniques.

Course outcomes
After learning the course, the students should be able:
1. To understand the basics of IC fabrication.
2. To understand the basics of lithography, etching, NEMS, MEMS etc.
3. To have knowledge of various thin film deposition and characterization techniques.
4. To know the fabrication of IC passive components, Memory devices and CMOS technology.

UNIT I Fabrication principles
Crystal growth techniques: Czochralski method and Float zone method; epitaxy: VPE and MBE; Oxidation: Thermal oxidation, Kinetics of growth; Diffusion: Basic diffusion process, diffusion equation; Ion implantation: range of implanted ions, ion distribution, ion stopping; Implantation damage, Annealing: Conventional and Rapid thermal annealing (RTA).

UNIT II Lithography and Etching
Lithography: Optical lithography, clean room, exposure tools, masks, photo resist, pattern transfer; Electron-beam lithography: Electron resist, Proximity effect; X-ray lithography, Extreme-UV & Ion-beam lithography.
Etching: Wet chemical etching and Dry etching; Metallization,
Isolation methods: p-n junction isolation, Mesa Isolation & Oxide isolation

UNIT III Thin film deposition and Characterization
Thin film deposition techniques: Physical vapor deposition (PVD): Sputtering, E-beam PVD; Advantages and disadvantages of PVD; Chemical vapor deposition (CVD): Low-Pressure CVD (LPCVD), Plasma-Enhanced CVD (PECVD); Advantages and disadvantages of CVD; Sol-Gel and Spin coating techniques;
Characterization Techniques: XRD, TEM, SEM, EDX.

UNIT IV Integrated Devices
Integrated passive components: Resistor, Capacitor, Inductor
MOSFET Technology: Basic fabrication process, Memory devices, CMOS technology: Well formation technology, Advanced isolation technology, Gate engineering technology, Challenges for Microelectronics: Scaling of MOS devices, Challenges for integration, System on a Chip.
Basics of MEMS & NEMS.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC305

Course No: P2ELPC305 (Core Course)
Title: **Lab course on Digital Signal Processing**
Credits: 2
Semester Exam: 25
Validity: December 2026, 2027 and 2028 Exams

Duration of Examination: 2 Hours

Max. Marks: 50
Sessional Assessment: 25

Each student has to perform a total of six experiments using MATLAB/PYTHON/Embedded-C/Cross-compiler. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. To generate a sinusoidal signal.
2. To implement a FIR filter.
3. To implement an IIR filter.
4. To implement DFT.
5. To record and process speech using data acquisition system.
6. To understand and process ECG signal.
7. To implement a filter on DSP kit.
8. To record and process heart sounds.
9. To acquire and process a noisy image.
10. To enhance a stored image using histogram based analysis.
11. To synthesize amplitude modulated signal.
12. To generate amplitude demodulated signal.

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
<tr><td>Mid Term appraisal</td><td>2 hours</td><td colspan="3">25% (12.5)</td></tr>
<tr><td rowspan="2">External Examination</td><td rowspan="2">2 hours</td><td rowspan="2">75% (37.5)</td><td>50% (25)</td><td>Project report</td></tr>
<tr><td>25% (12.5)</td><td>Viva-Voce</td></tr>
<tr><td colspan="2">Total</td><td colspan="3">50</td></tr>
</table>

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC306

Course No: P2ELPC306 (Core Course) Duration of Examination: 2 Hours
Title: **Lab course on Electronic Communication Systems**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: December 2026, 2027 and 2028 Exams

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. Study of Amplitude modulation.
2. Study of Amplitude demodulation.
3. Study of frequency modulation.
4. Study of frequency demodulation.
5. Study of Pulse modulation.
6. Study of Pulse demodulation.
7. Study of delta modulation & demodulation.
8. Study of adaptive delta modulation & demodulation.
9. Calculation of noise figure.
10. Study of FSK/PSK system.

Scheme of Examination

<table>
<tr><th>MCQ on LMS + Subjective Test</th><th>Time allotted for the examination</th><th colspan="3">%Weightage (Marks)</th></tr>
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External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC307

Course No: P2ELPC307 (Core Course) Duration of Examination: 2 Hours
Title: **Lab course on Industrial Electronics and Control Systems**
Credits: 2 Max. Marks: 50
Semester Exam: 25 Sessional Assessment: 25
Validity: December 2026, 2027, and 2028 Exams

Each student has to perform a total of six experiments. The teacher in-charge may add or delete experiments as per the availability of the equipment and need of the course with the authorization of the Head of the Department.

List of Experiments

1. To study SCR characteristics.
2. To study and obtain the characteristics of DIAC.
3. To study and obtain the waveforms for single-phase half-wave controlled converter.
4. To study IGBT characteristics.
5. To study IGBT applications.
6. To study and obtain the characteristics of TRIAC.
7. To perform experiment on single phase PWM inverter.
8. To study the effect of proportional integral derivative controller on the unit step response of feedback control system.
9. To study PID controller with second order system.
10. To study PI and PD controller using square wave input.

Scheme of Examination

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<tr><td colspan="2">Total</td><td colspan="3">50</td></tr>
</table>

External Practical/ Research (thesis/project/patent) examination

External Practical/ Research examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELPC308

Course No: P2ELPC308 (Core Course)
Title: **Seminar** Max. Marks: 50
Validity: December 2026, 2027 and 2028 Exams Credits: 2

Course Objectives
This course aims at exposing the students to recent and upcoming developments in the field of Electronics.

Course Outcomes
- This course will enhance knowledge of the students on emerging fields in the domain of Electronics.
- It will help the students to identify different research areas for taking project work in final semester of MSc programme.
- It will help the students to identify different research areas for pursuing research after completion of MSc programme.

Course Scheme
The students are required to make a detailed presentation on any latest topic falling in the Electronics domain duly approved by the Departmental Affairs Committee under the supervision of a faculty member from the department. The seminar will be of one hour duration including questions and answer session.

Scheme of Examination
The students shall be examined internally by Board of Examiners consisting of Head of the Department and other faculty members with following details:

Presentation: 25 marks Viva voce examination: 25 marks

M. Sc. Electronics
3rd Semester (NEP 2020)
(for the examinations to be held in the years 2026, 2027 and 2028)
Course No: P2ELMO351

Course No: P2ELMO351 (Core Course)
Credits: 4
Validity: December 2026, 2027 and 2028 Exams

Course Title: **MOOC/SWAYAM**
Max. Marks: 100

Course Scheme

Students shall have to choose a course of 4 credits of at least 12 weeks either from MOOC or NPTEL in the relevant field duly approved by Departmental Affairs Committee and get registered while in Semester-2. This is a compulsory course and must be successfully completed till the end of the Semester-4 to earn MSc Electronics Degree.

Two Year P. G. Syllabi in the subject of Electronics under NEP 2020
(M. Sc. Electronics 4th Semester)

Two Year P. G. Syllabi in the subject of Electronics, **M. Sc. Electronics, Semester-IV** under NEP 2020 for the examinations to be held in the years mentioned below:

Semester-IV: Validity May 2027, 2028 and 2029			
Course Title		**Course Code**	**Credits**
1. Smart Sensors and Instrumentation Systems	(4 Credits)	P2ELTC401	**24**
2. Data Communication	(4 Credits)	P2ELTC402	
3. Research	(16 Credits)	P2ELRC403	

M. Sc. Electronics
4th Semester (NEP 2020)
(for the examinations to be held in the years 2027, 2028 and 2029)
Course No: P2ELTC401

Course No: P2ELTC401 (Core Course)
Title: **Smart Sensors and Instrumentation Systems**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2027, 2028 and 2029 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives

Understanding of basic principles of advanced instrumentation used for biomedical, agriculture, and IoT based applications.

Course Outcomes

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

- Understand the important transduces and sensors
- Understand the working of biomedical instruments
- Apply electronic principles for agriculture development
- Sensors and networking principles to IoT based system design

UNIT I Basics transducers

Transducers: pressure transducers, temperature measurement, pulse sensors, tachometers, displacement, flow, humidity, thickness, pH, position; medical measurement constraints; interfering and modifying inputs; compensation techniques; electrical activity of excitable cells; electrode-electrode interface; polarization; electrode-skin interface and motion artifact, introduction to MEMS and their applications.

UNIT II Biomedical Instrumentation

Introduction to ENG, EMG, ERG, EEG, MEG systems; electrocardiograph: functional diagram, problems, transient protection; interference reduction circuits; intracellular electrodes; evoked potential; fetal electrocardiography; blood pressure measurements; heart sounds; computer tomography; magnetic resonance imaging; apnoea detectors; fetal monitoring; transmission of physiological signals over telephone lines; short wave and microwave diathermy; protection by power distribution and equipment design; physiological effects of electricity.

UNIT III Agro and environmental instrumentation

Functional analysis of agriculture machines; thermosdynamic limits to engine performance; heat losses and power at the piston; mechanical losses and power at the flywheel; induction motors and their principle of operation; single phase and three phase induction motors; variable speed electric motors and their efficiency; introduction to v-belt and chain drives; mechatronics and system control; sensors, types, and applications in agriculture; GPS and applications in agriculture; GIS and applications; global area networks.

UNIT IV Internet of Things

Introduction to IoT: emergence, Internet of everything, industrial IoT, smartness in IoT; IoT architecture: SOA based and API oriented; resource management; IoT data management; communication protocols: network , transport, application layers; IoT applications; security, privacy, and standardization of IoTs; fog computing, architectures, and applications; IoT robustness and reliability; TinyTO: two way authentication for constraint devices in IoT.

M. Sc. Electronics
4th Semester (NEP 2020)
(for the examinations to be held in the years 2027, 2028 and 2029)
Course No: P2ELTC402

Course No: P2ELTC402 (Core Course)
Title: **Data Communication**
Credits: 4
Test I & Test II: 40 Marks
Validity: May 2027, 2028 and 2029 Exams

Duration of Examination: 2.5 Hours
Max. Marks: 100
Major Test: 60 Marks

Course Objectives
To equip the students with the principles of Data communication systems.

Course Outcomes
At the end of the course the students should be able to

- Understand different Network topologies.
- Describe the principles of wireless and mobile communication.
- Understand the principle and techniques of optical communication.
- Describe the satellite communication techniques and radar principle.

Unit I Network Technologies
Network hardware: Topologies, switching: circuit, packet and message, routers and routing, network OSI model, LAN, WAN, MAN, wireless network, GSM, short messaging in GSM, ARPANET, INTERNET; protocols: one bit sliding window, HDLC, ALOHA, CSMA, TCP/IP, UDP, ISDN.

Unit II Wireless and Mobile Communication
Introduction: Overview, challenges in wireless networks, wireless network standards; Modern wireless communication systems: 2G, 3G & 4G. Introduction to mobile communication, main methods of radio transmission, GSM standards for cellular telephony, Architecture of GSM, Cellular mobile radio systems, Structure & working of cell phone, Performance criteria for cellular phones, operation of cellular systems, Concept of frequency re-use, power control for cellular systems, Function of MTSO & interconnection.

Unit III Optical Communication
Introduction to optical fibers, comparison of optical fiber with other interconnectors, attenuation in fibers, splices and connector optical fiber communication systems (analog and digital), opto-electronic ICs, Opto-coupler, OEIC-Transmitter/Receiver. Propagation in fibers, Step Index, Graded Index, Multipath dispersion, Material dispersion, combined effect.

Unit IV Satellite Communication and Radar
Introduction: satellite frequency bands, satellite system; satellite orbits: inclined, polar and equatorial, geostationary satellite; satellite channel: electromagnetic field propagation, transmission path and path loss, saturation flux density, satellite link analysis; satellite earth station, satellite transponder. Radar fundamental: block diagram, radar range equation, performance factor, detection of signal in noise; Doppler effect, MTI and pulse Doppler radar.

M. Sc. Electronics
4th Semester (NEP 2020)
(for the examinations to be held in the years 2027, 2028 and 2029)
Course No: P2ELRC403

Course No: P2ELRC403 (Core Course)
Credits: 16
Sessional Assessment: 200
Validity: May 2027, 2028 and 2029 Exams

Title: **Research**
Max. Marks: 400
Semester Exam: 200

Course Objectives

This course aims to motivate the students to take up relevant industrial problems as a major project so as to incorporate better practical skills, research capabilities and problem-solving abilities in them. This includes applying theoretical knowledge to design and build electronic systems, conducting research and understanding the latest trends in the field.

Course Outcomes

- This course will equip students with practical skills, enhance problem-solving abilities and foster research-based learning.
- Students will develop the ability to apply theoretical knowledge to real world problems besides analyzing, designing and implementing solutions.
- Students will gain experience in teamwork, communication and project management.

Course Scheme

The students are required to undertake a major research project on topics falling in the Electronics domain under the supervision of a faculty member from the department. The candidates are required to demonstrate the project undertaken by them in the form of a prototype and should be implemented using the hardware/software. The candidates will be further required to present a seminar based on the project work carried out by them.

Scheme of Examination

<table>
<tr><th>Examination</th><th>Duration of examination</th><th colspan="3">%Weightage (Marks)</th></tr>
<tr><td>Internal Examination</td><td>3 hours</td><td colspan="3">50% (200)
Regularity/Attendance = 50, Dissertation = 50, Seminar & Viva-Voce = 100</td></tr>
<tr><td rowspan="2">External Examination</td><td rowspan="2">3 hours</td><td rowspan="2">50% (200)</td><td>Dissertation</td><td>50</td></tr>
<tr><td>Viva-Voce</td><td>150</td></tr>
<tr><td colspan="2">Total</td><td colspan="3">400</td></tr>
</table>

Internal and External Examination

The students shall be examined internally by Board of Examiners consisting of Head of the Department and other faculty members.
External Practical examination shall be conducted by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned department, concerned teacher and outside expert to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/assess final practical performance/ dissertation of the students.