MATS UNIVERSITY

SCHOOL OF ENGINEERING AND INFORMATION TECHNOLOGY

Department of Electrical and Electronics Engineering

Syllabus

For

(Two-Year Full-Time DegreeProgramme)

Master of Technology (M. Tech.)

in

Power Electronics

(2025-2027)

(Semester Based Course)

Scheme of Teaching & Examination

M. TECH 1ST SEMESTER POWER ELECTRONICS

S. No.	Code	Subject	Periods per week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1	MTDSCBSC100	Research Methodology & IPR	3	-	-	70	30	3
1	MTDSCPE130	Power Converters	3	-	-	70	30	3
2	MTDSCPE131	Microcontroller & Embedded System	4	-	-	70	30	4
3	MTDSCPE132	Power Electronic Circuits	3	-	-	70	30	4
4	MTDSCPE133	Industrial Control Electronics	4	-	-	70	30	3
6	MTDSCPE134	Power Converters Lab	-	-	2	30	20	2
7	MTDSCPE135	Power Electronic Circuits Lab	-	-	2	30	20	2
Total			**17**	**-**	**4**	**410**	**190**	**21**

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Research Methodology and IPR
Total Theory Periods	:	45
Total Tutorial Periods	:	00
Subject Code	:	MTDSCBSC100

Unit I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit II: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit III: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit IV: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit V: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineeringstudents’
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property
9. in New Technological Age”, 2016.
10. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Power Converter
Total Theory Periods	:	45
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE130

UNIT: I

Analysis of switched circuits:- thyristor controlled half wave rectifier – R, L, RL, RC load circuits,classification and analysis of commutation.

UNIT: II

Single-Phase and Three-Phase AC to DC converters:- half controlled configurations operating domains of three phase full converters and semi-converters – Reactive power considerations.

UNIT: III

Analysis and design of DC to DC converters:- Control of DC-DC converters, Buck converters, Boostconverters, Buck-Boost converters, Cuk converters

UNIT: IV

Single phase and three phase inverters:- Voltage source and Current source inverters, Voltage control and harmonic minimization in inverters.

UNIT: V

AC to AC power conversion using voltage regulators: choppers and cyclo-converters, consideration of harmonics.

TEXT BOOKS:

1. Ned Mohan, Undeland and Robbin, "Power Electronics: converters, Application and design",John Wiley and sons. Inc, Newyork,3rd edition 2002.

2. Rashid M.H., „Power Electronics Circuits, Devices and Applications „, Prentice Hall India,New Delhi, 3rd edition 2004.

3. P.C Sen.," Modern Power Electronics „, Wheeler publishing Co, First Edition, New Delhi,1998.

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Microcontroller & Embedded System
Total Theory Periods	:	60
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE131

UNIT – I Architecture 16 bit microprocessors: Intel 8086 Architecture- Memory address space and data organization - Segment registers and memory segmentation - I/O address space - Addressing modes - Comparison of 8086 and 8088 - Basic 8086/8088 configuration - Minimum mode - Maximum mode - System timing. Bus interface. Interrupts and interrupt priority management. Intel 80286 Architecture- Comparison with 8086 processor. Architecture of 32 bit Microprocessors: Intel 80386 Architecture

UNIT – II Introduction to Microcontroller: brief History of 8051, 8052, 8031, 8751, AT89651, Pin configuration of 8051, 89C52RD2, Instruction set of 8051, Assembly language programming, internal structure of 8051, Power resetting, Built up RAM & ROM, I/O programming and Addressing modes.

UNIT – III Introduction to counter and timer: Counter and timer programming using 8051, interrupt programming, Types of interrupt.

UNIT – IV Introduction to Asynchronous serial communication: Data programming, RS232 standard, RS422 Standard, 1488 & 1489 standard, GPIB, Max 232 Driver, Serial communication programming.

UNIT – V Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems v/s General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems, embedded design concept.

TEXT BOOKS:

1. Barry B. Brey, the Intel Microprocessors 8086 to Pentium 4 - Architecture Programming and Interfacing, 6/e Pearson Education 2003.
2. James L. Antonacos, an Introduction to Intel Family of Microprocessors, 3/e Pearson Education, 2002.

REFERENCE BOOKS:

1. John Uffenbeck, The 80x86 Family Design Programming and Interfacing, 3/e Pearson Education, 2002.
2. YU-Cheng Liu & Glenn A Gibson, Microprocessor System, Architecture Programming & Design, Prentice Hall of India.
3. Douglas V Hall, Microprocessors & Interfacing, Tata Mc Graw hill, 1998.
4. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi & Mc Kinlay, 2nd Ed., PHI.

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Power Electronic Circuits
Total Theory Periods	:	45
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE132

UNIT – I Ideal and Real switches:- static and dynamic performance, Power diodes, Power Transistors, Power MOSFETS, IGBTs, Thyristor, GTO, TRIAC- Static and Dynamic Performance, Driver circuits. Turn on, Turn off and over voltage Snubbers for switching devices.

UNIT – II Uncontrolled rectifiers:- Single phase and three phase- Analysis with R and RL loads, effect of source inductance-Effect of Single Phase Rectifiers on Neutral Currents in a Three Phase Four- Wire System.
Controlled Rectifiers:-Single phase and Three phase-fully controlled and semi controlled Analysis with RL, RLE loads-Performance, Inversion mode of operation- Effect of source inductance-Dual converters- Circulating and Non circulating type.

UNIT – III Chopper: - Principle of operation, two quadrant and four quadrant choppers, PWM control- Forced commutation- Voltage and Current commutated choppers, multiphase chopper.

UNIT – IV Inverter: - Half Bridge and Full Bridge- Six Step and Two Level PWM. Harmonics and Voltage control in inverters- Current source inverter-Single phase and three phase. Introduction to Multilevel Invertors-Different types

UNIT – V AC Voltage Controllers: - Single Phase and Three phase, Principle of operation-analysis with R and RL loads, Thyristor Controlled Inductor
Cyclo converters- types- Single Phase and Three phase- Circulating and Non circulating type, Analysis with R and RL loads.

TEXT BOOKS:

1. Ned Mohan, Undeland, Robbins, Power Electronics; Converters, Applications and Design- 3rd edn, John Wiley, 2003.
2. M H Rashid; Power Electronics Circuits, Devices and Applications, Pearson.

REFERENCE BOOKS:

1. William Shepherd, Li Zhang., Power Converter Circuits, Marcel Dekker, 200.4
2. Joseph Vithayathil, Power Electronics; Principles and Applications, McGrawHill-1994
3. Philip T Krein, Elements of Power Electronics- Oxford, 1998
4. Issa Batarseh, Power Electronics Circuits, John Wiley, 2004

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Industrial Control Electronics
Total Theory Periods	:	60
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE133

UNIT – I

Review of switching regulators and switch mode power supplies: - Uninterrupted power supplies-solid state circuit breakers – programmable logic controllers

UNIT – II

Analog Controllers: - Proportional controllers, Proportional – Integral controllers, PID controllers, Feed forward control

UNIT – III

Signal conditioners: - Instrumentation amplifiers – voltage to current, current to voltage, voltage to frequency, frequency to voltage converters; Isolation circuits – cabling; magnetic and electro staticshielding and grounding.

UNIT – IV

Opto-electronic devices and control: - Applications of opto isolation, interrupter modules and photo sensors – fibre optics – Bar code equipment, application of barcode in industry.

UNIT – V

Stepper motors and servo motors: - control and applications. Servo motors – servo motor controllers – servo amplifiers – selection of servo motor – applications of servo motors.

TEXT BOOKS:

1. Michael Jacob, „Industrial Control Electronics – Applications and Design", Prentice Hall,1988.
2. Thomas, E. Kissel, „ Industrial Electronics"PHI, 2003
3. James Maas, „Industrial Electronics", Prentice Hall, 1995

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics
Subject	:	Electronics Converters Laboratory
Total Laboratory Periods	:	30
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE134

Experiments and computer simulations on:

1. Single phase, three phase Semi converters and Full converters,
2. DC-DC Choppers using SCRs and Self communicating Devices.
3. Single phase and three phase inverters using IGBTs,
4. AC-AC voltage regulators.
5. DC and AC drives

Semester	:	1st M. Tech. Course
Branch	:	Power Electronics Laboratory
Subject	:	Electronics Converters Laboratory
Total Laboratory Periods	:	30
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE135

List of Experiments:

A) HARDWARE

1. Single Phase Semi-converter with R-L load for continuous & discontinuous conduction modes.
2. Single Phase Full-converter with R-L load for continuous & discontinuous conduction modes.
3. Three Phase Full-converter with R-L-E load.
4. Controlled and Uncontrolled rectifier with different types of filters - continuous & discontinuous modes of operation.
5. Transformer and Inductor design.
6. Current & voltage commutated thyristorized chopper.
7. MOSFET/ IGBT/Transistor based DC Choppers (Buck & Boost)
8. Half bridge square wave inverter
9. Single-phase Sine triangle PWM inverter
10. Single Phase AC Voltage Controller

B) SIMULATION

1. 3-phase full converter and semi-converter with R, RL and RLE loads
2. 3-phase ac voltage controller
3. Closed loop control of DC-DC converter
4. 3-phase sine PWM inverter

Measurement of THD of current & voltage waveforms of controlled & uncontrolled 3-phaserectifiers.

Scheme of Teaching & Examination

M. TECH 2nd SEMESTER POWER ELECTRONICS

Code	Subject	Periods per week			Scheme of Marks		Total Credit
		L	T	P	ESE	IM	
MTDSCPE230	Switched mode Power Conversion	3	-	-	70	30	3
MTDSCPE231	Power Electronics Drivers	4	-	-	70	30	4
MTDSCPE232	PWM converters & Application	3	-	-	70	30	4
MTDSCPE233	Advance Digital Signal Processing	4	-	-	70	30	3
MTPDSEXXX	Professional Elective -I	3			70	30	3
MTDSCPE234	Power Modules Laboratory	-	-	2	30	20	2
MTDSCPE235	Power Electronics Drives Laboratory	-	-	2	30	20	2
Total		17		4	410	190	21

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Switched mode Power Conversion
Total Theory Periods	:	45
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE230

UNIT: I

Reactive Elements in Power Electronic Systems, Design of inductor, Design of transformer, Capacitors for power electronic applications.

UNIT: II

Basic concepts of Switched Mode power converters, DC-DC converters Characteristics, constituent elements, operating principles.

UNIT: III

Steady state analysis, stress and sizing of elements, control methods, duty ratio, current programmed, frequency programmed and sliding mode control, Dynamic analysis and frequency domain models.

UNIT: IV

Classification of resonant converters, Basic resonant circuit concepts, Load resonant converters, resonant switch converters, Zero voltage switching.

UNIT: V

Design of feedback compensators, unity power factor rectifiers, resistor emulation principle and applications to rectifiers.

Text Book:

1. Switched Mode Power Conversion, Course Notes, CCE, IISc, 2004.
2. Issa Batarseh, „Power Electronic Circuits", John Wiley, 2004.
3. Philip T Krein," Elements of Power Electronics „„Oxford Press,1997.

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Power Electronics Drives
Total Theory Periods	:	60
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE231

UNIT :I

Basic power electronic drive system, components, Different types of loads, shaft-load coupling systems, Stability of power electronic drive.

UNIT :II

Conventional methods of D.C. motor speed control, single phase and three phase converter fed D.C motor drive, Power factor improvement techniques, four quadrant operation.

UNIT :III

Chopper fed drives, input filter design, Step-up chopper for photovoltaic systems. Braking and speed reversal of DC motor drives using choppers, multiphase choppers.

UNIT :IV

Conventional methods of induction motor speed control, Solid state controllers for Stator voltage control, soft starting of induction motors, Rotor side speed control of wound rotor induction motors. Voltage source and Current source inverter fed induction motor drives.

UNIT :V

Speed control of synchronous motors, field oriented control, load commutated inverter drives, switched reluctance motors and permanent magnet motor drives.

Text Books:

1. P.C Sen, „Thyristor DC Drives", John wiely and sons, New York, 1981.
2. R.Krishnan, „Electric Motor Drives – Modeling, Analysis and Control", Prentice-Hall of India Pvt Ltd., New Delhi, 2003.
3. Bimal K.Bose, „Modern Power Electronics and AC Drives", Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	PWM converters & Application
Total Theory Periods	:	45
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE232

UNIT: I

AC/DC and DC/AC power conversion, overview of applications of voltage source converters, pulse modulation techniques for bridge converters.

UNIT: II

Bus clamping PWM, space vector based PWM, advanced PWM techniques, practical devices in converter; calculation of switching and conduction losses.

UNIT: III

Compensation for dead time and DC voltage regulation; dynamic model of a PWM converter, multilevel converters; constant V/F induction motor drives.

UNIT: IV

Estimation of current ripple and torque ripple in inverter fed drives; line – side converters with power factor compensation.

UNIT: V

Active power filtering, reactive power compensation; harmonic current compensation.

Text Books:

1. Mohan, Undeland and Robbins,‟ Power Electronics; Converters, Applications and Design‟,John Wiley and Sons,2nd edition , 1995.
2. Erickson R W,‟ Fundamentals of Power Electronics‟, Chapman and Hall, 2001.
3. Vithyathil J,‟Power Electronics: Principles and Applications „, McGraw Hill, 1995

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Advance Digital Signal Processing
Total Theory Periods	:	60
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE233

UNIT – I Review of signals and systems – Review of discrete-time Fourier transform (DTFT) – Discrete Fourier Transform – properties – inverse DFT – relationship between DFT and Z-transform – circular convolution – linear convolution using DFT – overlap add/save method – Fast Fourier Transform (FFT) - Decimation-in-time (DIT) & Decimation-in-Frequency (DIF) FFT algorithms.

UNIT – II Implementation of discrete-time systems: Block diagram and signal flow graph representation of IIR and FIR filters, Realization of IIR filters Direct –I, Direct-II, Cascade, Parallel, Ladder and Transposed Realization), Realization of FIR filters (Direct, Cascade and linear phase FIR structure). Design of digital filter, specification of FIR filters, General consideration, design of FIR filters, Symmetric and antisymmetric FIR filter, Design of FIR filter using Windows, Frequency sampling method, Hilbert Transformers.

UNIT – III Filter Design Techniques: Design of DTIIR filters. From continuous time filters, Introduction to analog filters for designing Digital filters (Butter worth and Chebyshev filters), filters design using Impulse invariant, Bilinear Z transform, Matched Z-Transform and Approximation of derivatives methods, frequency transformation, Frequency Transformations, Design of IIR Filters in frequency Domain, Difference between FIR and IIR filters.

UNIT – IV Multirate digital signal processing – sampling rate conversion – decimation, interpolation – sampling rate alternation or conversion – filter design and implementation for sampling rate alternation – direct form FIR digital filter structure, polyphase filter structure, time-varying digital filter structure – sampling rate conversion by an arbitrary factor, architecture of DSP processor - fixed point & floating point (block diagram approach) - applications of digital signal processors.

UNIT – V Issues involved in DSP processor design, Architecture and applications of TMS 320 C6XX, Multiprocessing with DSP processors, Applications of DSP to speech & radar signal processing, Adaptive removal of ocular artifacts from human EEGs.

TEXT BOOKS:

1. Advanced Digital Signal Processing, Proakis, McMillan
2. I feachor Emmanuel C. and Barrie W. Jervis, "Digital Signal Processing A Practical Approach" Pearson Education Ltd., Fifth Indian Reprint, 2005.

REFERENCE BOOKS:

1. Jhonson Jonny, "Digital Signal Processing", Tata Mc Graw Hill Publication.
2. Schafer R.W. and A.V. Oppenheim, "Digital Signal Processing", Prentice Hall of India, New Delhi, 1999

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Power Modules Laboratory
Total Laboratory Periods	:	30
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE234

List of Experiments:

1. Development of various configurations of power modules using SCRs, IGBTs, power transistors and power MOSFETs. Practical converter design considerations- Snubber design, gate and base drive circuits.

2. DC to DC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs.

3. DC to AC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs.

4. AC to AC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs..

5. Practical implementation of control techniques for voltage control, speed control and harmonic minimization.

Semester	:	2nd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Power Electronics Drives Laboratory
Total Laboratory Periods	:	30
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE235

List of Experiments:

1. Micro controller based speed control of Converter/Chopper fed DC motor.
2. Micro controller based speed control of VSI fed three-phase induction motor.
3. Micro controller based speed control of Stepper motor.
4. DSP based speed control of BLDC motor.
5. DSP based speed control of SRM motor.
6. Self-control operation of Synchronous motors.
7. Condition monitoring of three-phase induction motor under fault conditions.
8. Re-programmable Logic Devices and Programming

(a) VHDL programming – Examples

(b) Verilog HDL programming – Examples

(c) Realization of control logic for electric motors using FPGA.

9. Simulation of Four quadrant operation of three-phase induction motor.
10. Simulation of Automatic Voltage Regulation of three-phase Synchronous Generator.
11. Design of switched mode power supplies

Scheme of Teaching & Examination

M. TECH 3rd SEMESTER POWER ELECTRONICS

Code	Subject	Periods per week			Scheme of marks		Total Credit
		L	T	P	ESE	IM	
MTPDSEXXX	Professional Elective - II	3	-	-	70	30	4
MTPDSEXXX	Professional Elective -III - Through MOOC	3	-	-	70	30	3
MTDSCPE330	Renewable Energy Sources Laboratory	-	-	2	30	20	2
MTPR331	Project Work Phase - I	-	-	18	140	60	12
	Total	6		20	310	140	21

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments

Semester	:	3rd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Renewable Energy Sources Lab
Total Laboratory Periods	:	30
Total Tutorial Periods	:	00
Subject Code	:	MTDSCPE330

List of experiments

Solar energy

1) To study P-V and I-V characteristics of Solar module.
2) To study P-V and I-V characteristics of series and parallel combination of solar modules. 3) To study effect of varying irradiation level and temperature on P-V and I-V characteristics of solar panel.
4) To study effect of shading and tilt angle.
5) To study the effect of blocking and bypass diodes on solar panel.
6) To study the power characteristics of solar system using Ac-load, DC-load and AC-DC load. 7) To study the natural convection and forced circulation of water for calculating heat removal factor and loss coefficient.
8) To study the various PV based transformer less inverter topologies.
9) To study and implement perturb and observe method for Maximum power point tracking.

Wind energy

1) To study and simulate the IG , PMSG and DFIG based wind energy system.
2) To study and simulate the interconnected SG and IG based wind energy system.
3) To study and implement the vector control for grid connected PMSG based wind energy conversion system (WECS).
4) To study the effects of FACTS devices with WECS for power quality improvement.

Hydro Power

1) Any relevant case study on installed hydro power plant.

Semester	:	3rd M. Tech. Course
Branch	:	Power Electronics
Subject	:	Project Work - Phase I
Total Project Periods	:	18
Total Tutorial Periods	:	00
Subject Code	:	MTPR331

The objective of the phase – I of the student's project work is to prepare themselves to undertake lively project which will found end application to the industry /society. Preparation for the project work involve

- The project for M. Tech should be carried by individual student.
- Make a preliminary survey and data collection or literature review of the project proposed in the next semester.
- Conduct a thorough literature survey and publish or present a paper of the proposed work in any one of the forthcoming International seminars/ conferences/journals.
- Plan for necessary supports, facilities, analytical tools and fixation of faculties /supervisors for the final semester project work.
- Partial work of the project is to be carried out in Phase-I and remaining in Phase-II which leads to the Thesis submission at the end of the project work.
- Project should be research oriented and at least two papers should be presented/accepted in the International Journals for the Thesis submission.

Scheme of Teaching & Examination

M. TECH 4th SEMESTER POWER ELECTRONICS

Code	Subject	Periods per week			Scheme of marks	
		L	T	P	ESE	IM
MTPR430	Project Work Phase - II	-	-	36	315	135
Total			-	36	315	135

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments

Semester	:	4th M. Tech. Course
Branch	:	Power Electronics
Subject	:	Project Work - Phase II
Total Project Periods	:	36
Total Tutorial Periods	:	00
Subject Code	:	MTPR430

The objective of the project work is to enable the students to work individually on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Students can opt for the co- guide from industries/ other colleges to get the necessary supervision. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report in the form of Thesis covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines. It is mandatory that the project selected should be research oriented and at least two papers/articles related to the project work should be published/ accepted for publication in the international journals for Thesis submission.

The continuous assessment shall be made as prescribed by the regulation.