Syllabus

for

B. Tech. Electrical Engineering

B.Tech. Electrical & Electronics Engg.

of

Second Year

(Effective from the Session: 2014-15)
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>COURSE NO</th>
<th>SUBJECT</th>
<th>PERIOD</th>
<th>EVALUATION SCHEME</th>
<th>CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sessional evaluation</td>
<td>exam eSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sessional evaluation</td>
<td>exam eSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sessional evaluation</td>
<td>exam eSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sessional evaluation</td>
<td>exam eSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sessional evaluation</td>
<td>exam eSE</td>
</tr>
</tbody>
</table>

**THEORY SUBJECTS**

1. NAS-301/-NOE 031-039 Mathematics III/Science Based Open Elective 3 1 0 30 20 50 100 150 4
2. NME-309 Thermal & Hydraulic Machines 3 1 0 30 20 50 100 150 4
3. NEE-301 Electro-Mechanical Energy Conversion–I 3 1 0 30 20 50 100 150 4
4. NEE-302 Electrical Measurement & Measuring Instruments 3 1 0 30 20 50 100 150 4
5. NEE-303 Basic System Analysis 2 1 0 15 10 25 50 75 3
6. NHU301/NHU302 Industrial Psychology/Industrial Sociology 2 0 0 15 10 25 50 75 2
7. AUC-001/AUC-002 Human Values & Professional Ethics/Cyber Security 2 0 0 15 10 25 50 75

**PRACTICAL / DESIGN / DRAWING**

8. NME-359 Thermal & Hydraulic Machines Lab 0 0 3 10 10 20 30 50 1
9. NEE-351 Electromechanical Energy Conversion- I Lab 0 0 3 10 10 20 30 50 1
10. NEE-352 Electrical Measurement Lab 0 0 2 10 10 20 30 50 1
11. NEE-353 Numerical Technique Lab 0 0 2 10 10 20 30 50 1
12. NGP-301 General Proficiency Lab 0 0 0 0 0 0 0 0 0

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics/Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

**Note:** Numbers of departmental subjects/labs in any semester may vary as per requirement keeping subject total and credit total unchanged.
### STUDY AND EVALUATION SCHEME

**B-Tech. Electrical Engg./Electrical & Electronics Engineering**

**YEAR: 2nd SEMESTER-IV**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>COURSE NO</th>
<th>SUBJECT</th>
<th>PERIOD</th>
<th>EVALUATION SCHEME</th>
<th>CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SESSIONAL EVALUATION</td>
<td>EXAM ESE</td>
<td>SUBJECT TOTAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>THEORY SUBJECTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>NOE-041-049/ NAS-401</td>
<td>Science Based Open Elective/ Mathematics III</td>
<td>3 1 0</td>
<td>30 20</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>NEC-409</td>
<td>Analog &amp; Digital Electronics</td>
<td>3 1 0</td>
<td>30 20</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>NEE-401</td>
<td>Electro-Mechanical Energy Conversion–II</td>
<td>3 1 0</td>
<td>30 20</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>NEE-402</td>
<td>Network Analysis and Synthesis</td>
<td>3 1 0</td>
<td>30 20</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>NEE-403</td>
<td>Instrumentation &amp; Process Control</td>
<td>2 1 0</td>
<td>15 10</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>NHU401/ NHU402</td>
<td>Industrial Psychology/Industrial Sociology</td>
<td>2 0 0</td>
<td>15 10</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>AUC-002/ AUC-001</td>
<td><em>Cyber Security/ Human Values &amp; Professional Ethics</em></td>
<td>2 0 0</td>
<td>15 10</td>
<td>25</td>
</tr>
</tbody>
</table>

**PRACTICAL / DESIGN / DRAWING**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>COURSE NO</th>
<th>SUBJECT</th>
<th>PERIOD</th>
<th>EVALUATION SCHEME</th>
<th>CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SESSIONAL EVALUATION</td>
<td>EXAM ESE</td>
<td>SUBJECT TOTAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>NEC-459</td>
<td>Electronics Lab</td>
<td>0 0 3</td>
<td>10 10</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>NEE-451</td>
<td>Electro-Mechanical Energy Conversion – II Laboratory</td>
<td>0 0 3</td>
<td>10 10</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>NEE-452</td>
<td>Network Lab</td>
<td>0 0 2</td>
<td>10 10</td>
<td>20</td>
</tr>
<tr>
<td>11</td>
<td>NEE-453</td>
<td>Electrical Instrumentation Lab</td>
<td>0 0 2</td>
<td>10 10</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>NGP-401</td>
<td>General Proficiency</td>
<td>- - -</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.*
NME-309 : THERMAL AND HYDRAULIC MACHINES

UNIT-I:
Thermodynamic equilibrium, cyclic process, enthalpy, Zero, first and second laws of thermodynamics, Carnot cycle, concept of entropy, properties of steam, processes involving steam in closed and open systems, Enthalpy.

Vapour Pressure Cycles: Rankine cycle, reheat cycle, Regenerative cycle

UNIT-II:
Steam Turbine: Theoretical approach only of Classification, impulse and reaction turbines their velocity diagrams and related calculations, work done and efficiencies, re-heat factor, staging, bleeding and governing of turbines.

Gas Turbine: Theoretical approach only of Classification, Brayton cycle, working principle of gas turbine, gas turbine cycle with intercooling, reheat and regeneration, stage and polytrophic efficiencies.

UNIT-III:
Otto, Diesel and Dual cycles, introduction to 2-stroke and 4-stroke SI and CI engines

UNIT-IV
Impact of Jet: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat and curve).

Hydraulic Turbines: Classification, heads and efficiencies, construction, working, work done and efficiency of impulse turbines.

UNIT-V
Centrifugal Pump: Classification, construction, working.

Reciprocating Pump: Classification, construction, working.

Text Books:
2. Steam & Gas Turbine by R.Yadav, CPH Allahabad

Reference Books:
NEE – 301: ELECTRO-MECHANICAL ENERGY CONVERSION –I

Unit – I
Principles of Electro-mechanical Energy Conversion- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque, Generated emf in machines; Torque in machines with cylindrical air gap. (7)

Unit – II
D.C. Machines- Construction of DC Machines, Armature winding, Emf and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C. generators. (9)

Unit – III
D.C. Machines (Contd.)- Performance characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson’s and Swinburn’s Test). (8)

Unit – IV
Single Phase Transformer- Phasor diagram, Efficiency and voltage regulation, All day efficiency.
Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits & demerits and applications. (8)

Unit – V
Three Phase Transformers - Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.(9)

Text Books:
3 P.S.Bimbhra, “Electrical Machinery”, Khanna Publisher

Reference Books:
7 P.S. Bimbhra, “Generalized Theory of Electrical Machines”, Khanna Publishers
UNIT I
(1) **Philosophy of Measurement**- Methods of measurement, Measurement system, Classification of instrument systems, Characteristics of instruments & measurement systems, Errors in measurement & its analysis, Standards. (4)
(2) **Analog Measurement of Electrical Quantities**- Electrodynam, Thermocouple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynam wattmeter, Three Phase wattmeter, Power in three phase systems, Errors & remedies in wattmeter and energy meter. (5)

UNIT II
Instrument Transformers:CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (8)

UNIT III
**Measurement of Parameters**- Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q meter. (9)

UNIT IV
(1) **AC Potentiometers**- Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. (4)
(2) **Magnetic Measurement**- Ballistic galvanometer, Flux meter, Determination of hysteresis loop, measurement of iron losses. (4)

UNIT V
(1) **Digital Measurement of Electrical Quantities**- Concept of digital measurement, Block diagram, Study of digital voltmeter, Frequency meter, Spectrum analyzer, Electronic multimeter. (3)
(2) **Cathode Ray Oscilloscope**- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components, Applications of CRO in measurement, Lissajous Pattern, Dual trace & dual beam oscilloscopes. (3)

Text Book:

Reference Books:
UNIT I
Introduction to Continuous Time Signals and Systems: Basic continuous time signals, Unit step, Unit ramp, Unit impulse and periodic signals with their mathematical representation and characteristics. Inversion, Shifting and Scaling of signals, Introduction to various types of systems, Causal, Stable, Linear and Time invariant systems.

Analogous System: Linear mechanical elements, Force-voltage and force-current analogy, Modeling of mechanical and electro-mechanical systems. (9)

UNIT II
Fourier Transform Analysis: Exponential form and compact trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis. (8)

UNIT III

UNIT IV

UNIT IV
Z-Transform Analysis: Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function. (7)

Text Books:
2. M E Van-Valkenberg; “Network Analysis”, Prentice Hall of India
3. A. Anand Kumar, “Signals & Systems”, PHI

Reference Books:
5. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
NEC-409 : ANALOG AND DIGITAL ELECTRONICS

ANALOG ELECTRONICS:
UNIT-I:
Special Diodes-
LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications.
Transistors as a switch.
UNIT-II
Frequency Response:
Amplifier transfer function, low and high frequency response of common emitter and common source amplifiers.
Feedback:
General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.
UNIT-III:
Basic principle of sinusoidal oscillator, R-C Phase Shift and Wein Bridge oscillators, tuned oscillators-
Collpits and Hartley; Crystal oscillator
DIGITAL ELECTRONICS:
UNIT-IV
Combinational Logic Circuits: Multiplexers/Demultiplexures, Encoders/Decoders.
Sequential Logic Circuits: latches, flip-flops- S-R, T, D, J-K.
Shift Registers: Basic principle, serial and parallel data transfer, shift left/right registers, universal shift register.
Counters: Mode N Counters, ripple counters, synchronous counters, ring/Johnson counters.
UNIT-V
OP-AMP applications - Astable, Monostable and Bistable multivibrators, Schmitt trigger, IC-555 Timer, A/D and D/A converters.
Voltage Regulators: Series, shunt and switching regulators, op-amp based configurations.
Memories: Introduction to ROM, RAM; Sequential Memory, Memory organization.
Text Books:
Reference Books:
UNIT - I  
\(9\)  
**UNIT - II**  
**Synchronous Machine II** - Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.  
**Synchronous Motor** - Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser.  
\(8\)  
**UNIT - III**  
**Three phase Induction Machine – I**  
Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque- slip characteristics, No load & blocked rotor tests, Efficiency, Induction generator & its applications.  
\(9\)  
**UNIT - IV**  
**Three phase Induction Machine- II**  
Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit).  
\(8\)  
**UNIT - V**  
**Single phase Induction Motor** - Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor.  
\(8\)  
**Text Books:**  
4. P.S.Bimbhra, “Electrical Machinery”, Khanna Publisher  
**Reference Books:**  
NEE- 402 NETWORK ANALYSIS AND SYNTHESIS

L T P  3 1 0

Unit – I
Graph Theory- Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analyses. (7)

Unit – II:
Network Theorems (Applications to AC Networks)- Superposition theorem, Thévenin’s theorem, Norton’s theorem, Maximum power transfer theorem, Reciprocity theorem. Millman’s theorem, Compensation theorem, Tellegen’s theorem. (8)

Unit – III
Transient Circuit Analysis- Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. (7)

Unit – IV
Network Functions- Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions. (3)

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A’B’C’D’, g and h parameters, Reciprocity and symmetry, Inter-relations between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation. (8)

Unit – V
(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (5)

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters. (4)

Text Books:

Reference Books:
Unit-I
Transducer – I
Definition, Advantages of electrical transducers, Classification, Characteristics, Factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT (7)

Unit-II
Transducer – II
Capacitive, Piezoelectric, Hall effect and Opto electronic transducers. Measurement of motion, force, pressure, temperature, flow and liquid level. (6)

Unit-III
Telemetry
General telemetry system, Land line & radio frequency telemetering systems, Transmission channels and media, Data receiver & transmitter.

Acquisition System
Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV
Display Devices and Recorders

Process Control
Principle, Elements of process control system, Process characteristics, Electronic, pneumatic & digital controllers. (7)

Text Books:

Reference Books:
6. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
NEE-351: ELECTROMECHANICAL ENERGY CONVERSION - I LAB
L T P  0 0 3

Note: Minimum eight experiments are to be performed from the following list:

1. To obtain magnetization characteristics of a d.c. shunt generator.
2. To obtain load characteristics of a d.c. shunt generator and compound generator (a)
   Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a dc shunt machine using Swinburn’s test.
4. To perform Hopkinson’s test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a dc shunt motor.
6. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7. To obtain speed control of dc separately excited motor using Conventional Ward-
8. To study polarity and ratio test of single phase and 3-phase transformers.
9. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer
   using C.C. and S.C. tests.
10. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner’s test.
11. To obtain 3-phase to 2-phase conversion by Scott connection.
12. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

College may add any two S/W based experiments in the above list.

NEE-352: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS LAB
L T P  0 0 3

Note: Minimum eight experiments are to be performed from the following list:

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if
   r.m.s.value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of
   capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin’s double bridge.
7. Measurement of inductance by Maxwell’s bridge.
10. Measurement of capacitance by Owen’s bridge.
11. Measurement of capacitance by De Sauty bridge.
13. Study of frequency and differential time counter.

College may add any two experiments in the above list.
Note: Minimum eight experiments are to be performed from the following list:

S/W Based Experiments using MATLAB or Equivalent software.
1. Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.

College may add any three experiments in the above list.

Experiments : Minimum 10 experiments out of following:

1. Study and working of Two stroke petrol Engine
2. Study and working of Four stroke petrol Engine
3. Study and working of two stroke Diesel Engine
4. Study and working of four stroke Diesel Engine.
5. Study of compounding of steam turbine
6. Study of Impulse & Reaction turbine
8. Turbine experiment on Pelton wheel.
9. Turbine experiment on Francis turbine.
10. Turbine experiment on Kaplan turbine.
11. Experiment on Reciprocating pump.
12. Experiment on centrifugal pump.
NEE- 451: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY

L T P  0 0 3

Note: Minimum eight experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method.

Software based experiments (Develop Computer Program in ‘C’ language or use MATLAB or Equivalent software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
Note: Minimum eight experiments are to be performed from the following list.
1. Verification of principle of superposition with ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegen’s theorem for two networks of the same topology.
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade also study loading effect in cascade.
12. To determine attenuation characteristics of a low pass / high pass active filters.

College may add any three S/W based experiments in the above list.

NEE – 453: ELECTRICAL INSTRUMENTATION LAB.

Minimum eight experiments are to be performed from the following list.

1. Measurement of displacement using LVDT.
5. Measurement of water level using strain gauge based water level transducer.
7. Measurement of temperature by RTD.
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor.
12. Design and test a signal conditioning circuit for any transducer.

College may add any three S/W based experiments in the above list.
ANALOG ELECTRONICS:

Note: Select at least any four out of the following:
1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any four out of the following:
9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations.