Syllabus as per AICTE Model Curriculum

Credits:

1. HU/SS/MAN: 20 - 25 (7/6 theory papers @ 3/4-credits) [7 theory papers @ 3-c) = Total 21 compulsory]
2. Basic Sciences: 20-30 (6 theory @ 3 credits + 4 Practicals @ 2-credit) (30; 6x3=18 + 4x2=8 : Total 26 compulsory)
3. Engineering Sciences: 30-35 (4/5 theory @ 3/4-credit + 4/5 Practicals @ 2-credit) (32; 6 theory papers @ 4 credits= 24 + 4 practicals @ 2 credits = 8)
4. Professional core: 45-55 (50; 8 theory @ 4-credits=32+ 6 Practicals @ 3c =18)
5. Professional elective: 25-30 (5/6 theory @ 5-credit [courses with practical to be divided as 3T+2P] (25-30) (25; 5 theory @ 5 credits=25)
6. Free elective: 25-30 (5 theory @ 5 credits=25)
7. Seminar & Industrial Training etc: 5-10 credits (10)
8. Project: 15 credits (15)

Total credit: 154 + 46 (Project)

Taking 4 years and eight semesters, with 5 workings days of 7 hours each there can be a total of 5x3= 15 lecture hours, 15 practical hours and 5 tutorial hours. 3 credits (L) = 3 hours/week, 2 credits (P) = 3 hours/week, & 1 credit (T) = 1 hours/week.

Suggested Curricula

Distribution of load:

Semester 1: 1 HU (English:[3]), 2 Basic Sc (Math:[3]+Physics-1/Chemistry-1:[3+2]) + 2 Engg Sc (Basic Electrical Engg/Electronics:[3+2]+Basic Enviromental Science:[3]) + Engg Drawing (1) + Workshop Practices (2) (27 hours + 8 remedial/tutorials: 35hours) [22]

Semester 2: 1 HU(Ethics & values:[3]), 2 Basic Sc (Physics-2/Chemistry-2:[3+2]+Chemistry-1/Physics-1:[3+2]) + 2 Engg Sc (Basic Electrical Engg/Electronics:[3+2] + Basic Digital Electronics; [3+2]) + Computer Graphics (1)(30 hours + 5 tutorials: 35 hours) [24]

Semester 3: 1 HU (Introduction to organisational behaviour:[3]), 2 Basic Sc (Basic Computation & Principles of Computer Programming:[3+2] + Mathematics-2/Biology:[3]) + 1 Engg Sc. (Basic Computer Architecture & Microprocessors:[3+2]) +2 Professional core ([4+3]+4) (32 hours+ 3 tutorials/remedial: 35) [27]

Semester 4: 1 HU (Economics for Engineers/E-commerce:[3] + 1 Engg Sc. (Solid Mechanics, Heat Transfer & Thermodynamics / Fluid Mechanics & Rate Processes:[3]) + 2 Professional cores ([4+3]+[4+3]) + Communication skills/Report writing (2) +Language Laboratory (1) (32 hours + 3 hours for remedial/tutorials) [23]

Semester 5: 1 HU (Principles & Practices of Management:[3]) + 2 Professional cores ([4+3]+[4+3]) + 1 Professional Elective ([3+2]) + 1 Free Elective [5]) (35 hours) [27]

Semester 6: 1 HU (Entrepreneurship Development:[3], 2 Professional cores ([4+3]+[4])+ 2 Professional Electives (5+5) + 1 Free Elective (5) (35 hours) [29]

Semester 7: 1 HU (Introduction to organisational behaviour:[3]) + 2 Professional Electives (5+5) + 3 Free Electives (5+5+5) (30 hours + 5 hours for tutorial/remedial/project preparation) [28]

Semester 8: Seminar (2) + Group Discussion (2) + Industrial Training (1) + Project (15) [20]

Total credit = 200

In each year an average of 3 credit (3 hour) theory classes + 2 credit (3 hour) practical classes are scheduled. [5 days x (7 working +1 lunch) hours/day per week is assumed.]

- **HU-7 (Cr L3x7 = 21), B.Sc. -6 (L3x6=18+P2x4=8) , B.Eg-6 (L4x6=24+p2x4=8), P.C.-8 (L4=8=32+P6x3=18), P.E.-5, F.E.-5**

Compulsory **Humanities, Social & Management Sciences** are: 1. Communicative English, 2.Principles & Practices of Management, 3. Economics for Engineers, 4. Introduction to organisational behaviour, 5. Ethics, Phlosophy & Values, 6. Entrepreneurship Development 7. Technology Management [7 Papers]
Other options given in AICTE model curriculla are: History of Science & Technology, Development Economics & India, Economic Policies, Creativity & Innovation, Indian Society, Literature & Culture, Production & Operations Management, Quantitative Techniques for Business, Decisoions, Human Resource Management. (These may part of free electives)

Compulsory **Basic Science courses** are as per AICTE model curricula:
(***Electrical, Electronics, Computer, IT, Mechanical, Civil etc)*** 1) Physics-1, 2) Physics-2 (both with practical), 3) Chemistry (with practical), 4,5) Mathematics -1 & 2 (laboratory practices may or may not be included – may be part of tutorial and assignment – 6) Numerical methods & computer programming (one)
(*Chemical, Pharmaceutical and Biotechnology etc*):1)Physics -1 (with practical), 2) Chemistry-1 , 3) Chemistry -2 (with practical), 4) Mathematics -1, 5) Biological Sciences -1 and 6) Numerical methods & computer programming (one).

For Electrical & associated track compulsory **Engineering Sciences** are: 1. Electrical & Electronic Measurement & Instruments, 2. Basic Electronics (Analog & Digital Electronics) 3. Basic Electrical Engg (Electrical Circuits & Networks/Network Analysis & Synthesis), 4. Basic Computer Architecture & Organisation 5. Basic Communications Engineering, 6) Environmental Science. [6 Papers]

Laboratory practices include: Basic electrical, Basic Electronics, Programming, Computer Graphics & Workshop Practices.
Energy Systems, Engineering Mechanics, Earth Sciences, Bio-Mechanics etc may be ***free electives***.

For Electrical & associated track compulsory **Professional Core** are: 1. Electronic Devices & Circuits, 2. Analog & Digital circuits, 3. Electrical Machines 4. Analog & Digital Communication 5. Electromagnetics 6. Basic Control Theory, 7. Basic Microprocessors & Microcontrollers, 8. Basic Computer Communication.

The Final Semester is devoted to Project work. if there are no theory classes in the final semester deserving students may have the opportunity of working as interns in research institutes, industries etc for acquiring professional skill and also to get exposed to various research opportunities for future.

There is also scope for intending students to take up certification (major) courses that involve hands-on traing in state-of-the-art technologies. University may start a centralised consortium in collaboration with affiliated colleges and industries for imparting professional training to B.Tech. students, starting from the summer break between semesters 6 & 7. Students performing well in the certification course on industrial training between sems 6& 7 may be encouraged to take further training during final semester so that the two certificates may be combined to give a B.Tech.(major) degree.

1. Basic Sciences: (Common for all engineering branches)

A & B. Basic Physics: Requirement for Electrical / Electronic branches:
Only **basic** & **fundamental concepts, important laws & theorems**; focus on applicability of the knowledge in engineering. Stress on units & dimensions. (***two papers***) (76 lecture hours)

- *Details and derivations to be avoided as far as possible*;

Module-1: ***Electrostatics***: Electric charge, Coulomb Law, electric field – difference between field intensity & displacement, Gauss Theorem, potential & potential energy; (5) [needed to understand devices, circuits & systems]

Module-2: ***Electrical Materials***: Basic ideas of conductors, resistors, semiconductors & insulators; polarisation, capacitance & capacitors; (4).[needed to understand circuits & systems]

Module-3: ***Electrical Currents***: Principal concepts & definitions, electron theory of conduction, Direct current laws, KVL & KCL; (3).[needed to understand circuits & systems]

Module-4: ***Current & Magnetic Field*** : Ampere's Law, Biot-Savart-Laplace Law, effect of Magnetic field on current carrying conductors, Electromagnetic induction, inductance & inductors, eddy currents, self & mutual induction; very brief discussion of transformers, concept of moving coil galvanometer, use of these concepts in working of motors & generators.(6) [needed to understand circuits & systems]

Module-5: ***Magnetostatics:*** Magnetic Properties of Matter, Concept of magnetic moment, basic ideas about dia-, para-, and ferro-magnetic materials; focus on their need for different applications.(6) [needed to understand components of circuits & systems]

Module-6: ***Electromagnetic Theory***: Maxwells Theory, Maxwell's equations, Concept of conduction & displacement currents, Poyenting vector, conservation laws for electromagnetic fields; Concept of electromagnetic radiation from conductors– introduction to antenna; *Electromagnetic waves; Electromagnetic wave propagation; Application to radio communication;* (8) [needed to understand radio communication]

Module-7: ***Atomic Theory*** : Atomic structure (periodic table, atomic number, atomic weight), quantum numbers, crystal structures, crystal axes, bonding in solids, energy band theory, conductors & insulators in terms of band diagram, semiconductors. Fluorosence, Phosphorescence (8) [needed to understand semiconductor physics]

Module-8: ***Optics:*** Light /optical waves, Snell's Laws of reflection & refraction, interference, diffraction & polarisation of light. (6) [needed to understand optical communication]

Module-9: ***Heat***: Heat & Temperature, Heat transfer - conduction, convection & radiation of heat, adiabatic and isothermal processes (concept only); basic ideas of specific heat, latent heat etc; heal dissipation (8) [needed to understand heat dissipation from devices, circuits & systems]

Module-10:***Thermodynamics***: Laws of Thermodynamics, adiabatic, isothermal & isobaric processes, quasi-static processes, Carnot cycle, entropy & enthalpy – their physical significance in terms of applications in real life situations; (8).[needed to understand machines etc]

Module-11: ***Classical Mechanics:*** Newton's Laws revisited; Work & Mechanical energy (Concept of force, work, power, potential energy, kinetic energy); Concept of torque; Conservation of momentum & energy; Laws of gravitation; Centrifugal force & centripetal acceleration; Kepler's Laws for celestial bodies; Concept applied to satellites; Satellite orbits. (10) [needed to understand satellite communication]

Module -12: ***Properties of Matter***: Elastcity (concepts only); Young's modulus; Stress & strain; Surface tension. (4) [needed to understand any advanced or elective paper on electronic]

C&D. Mathematics: Requirement for Electrical / Electronic branches: (list of mathematical concepts required for handling this courses, to be distributed in three semesters in keeping with the other professional topics to be covered, of which programming & Numerical computation (***Basic Computation & Programming Languages + Practical: Computation & Programming Laboratory)*** is one.

Differential Calculus, Discrete Maths, Set Theory, Graph Theory, Matrix, Transforms, Optimisation concepts.

E: Numerical methods & computer programming (with Lab)

F: Basic Chemistry (with Lab)

2. **Basic Engineering Sciences**: **(Common for all Electrical, Electronics & Associated branches)**

A) ***Electrical & Electronic Measurement & Instrumentation***: (Instrumentation & control department) **Engg Sc.**

Module 1: ***Measurement & Error Estimation***. (general, discussion of various errors, how to estimate errors, calculation of errors)

Module 2: ***Electronic Laboratory Equipment***: Concept of ideal current & voltage sources, loading, Analog & digital multimeters, Power supply & CRO. (4)

Module 3: ***Basic Electronic Instruments:***

Module 3: ***Basic Electrical Instruments.***

B) ***Basic Electronics /Analog & Digital Electronics :*** (Electronics department) **Engg Sc.**

Module 1: ***Pre-requisites:*** (Review only – has been taken up in Physics)

a) ***Basic Electronic Material***: Conductor, Insulator & Semiconductor, Concept of band-gap, electrons & holes, intrinsic & extrinsic semiconductors, concept of Fermi level, carrier concentration in terms of Fermi energy, F.L. shift with doping. (3)

b) ***Basic Circuit Analysis***: Review of Kirchoff's laws, Thevenin's & Norton's theorem. Superposition principle (3)

Module 2: ***Physics of Semicnductor-semiconductor & Metal-Semiconductor Junctions:*** p-n junction, rectification, forward and reverse current, differential diode resistance, diode junction capacitance, varactor diode, diode swiching & diode switch, rectifier diode, recifier circuits, diode clippers & clampers, Schottky contact & Schottky diode. (5)

Module 3: ***Active Devices - Transistors:***

a) ***Bipolar Junction Transistors:*** Operating principle of BJT – current controlled bipolar device, Input & output characteristics (active , saturation & cut-off regions), CE, CB & CC modes (comparison), diode hybrid parameters, biasing. . (5)

b) ***Transverse Field Effect Devices:*** Basic idea of field effect devices, gate-channel isolation, voltage controlled uni-polar device, JFET & MOS I-V characteristics, MOS-capacitance, CMOS, discussion of MOS as a VLSI device, Biasing (5)

Module 4: ***Active Analog Circuits:***

a) ***Amplifiers & Oscillators***: Feedback concept, negative & positive feedback circuits, Berhausen criterion, Amplifiers & Oscillators, Differential amplifier, (4)

b) ***Operational Amplifier:*** Ideal OPAMP, CMRR, Open & Closed loop circuits - importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, voltage follower/buffer cicuit, adder, integrator & differentiator, comparator & instrumentation amplifier. (5)

Module 5: ***Basic Digital Circuits:***
a) ***Boolean Algebra***: (4)
b) ***Digital Gates:***(4)

Practical - ES1: Basic Electronic Engg.
[Emphasis on ability to take measurement accurately and interpret results in terms of errors calculated, assemble and test simple circuits involving diodes, transistors & OPAMPs, stress on circuit tracing & fault finding, learn to solder components correctly]

C) ***Electrical Circuits, Networks:*** (Electrical department) **Engg Sc.**
Module 1: a) ***Circuit variables & Laws***: Definitions of current, voltage & power; Sources (battery) & loads (resistors, reactances & impedances); Ohm's laws & Kirchhoff's laws, elementary circuit analysis.(3)
b) ***Properties of resistive circuits***: Series & parallel resistance, linearity & superposition, Thevenin & Norton networks. (3)
c) ***Systematic analysis method***: Node & mesh analyses – simple problems. (2)
Module 2: ***Energy storage & dynamic circuits***: Capacitors, inductors, C-R & L-R circuits, Impedance & admittance, AC circuit analysis, phasor diagram & resonance.(6)
Module 3: ***AC power & three-phase circuits***: Power in a.c. circuits; Power systems; Balanced three-phase circuits, Residential circuits & wiring. (4)
Module 4:***Transformers & Mutual Inductance***: Ideal transformers, magnetic coupling & mutual inductance, circuits with mutual inductance (related machine – basic operating principle). (5)
Module 5:***Transient response***: First order transients (zero-input response, step response, pulse response, switched d.c. transients), second order transients.(5)
Module-6: ***Electrical Machines***: Basic concepts of some common, essential electrical machines. (12)

Reference: Circuits by A. Bruce Carlson (Thomson)

Practical -ES2: Basic Electrical Engg (Lab).

D) ***Basic Communication Theory:*** (Electronics & Communication Department) **Engg Sc.**
Module -1: ***Signals & Systems:*** (8)
Module 2: ***Communication Theory:***(8)
Module-3: ***E.M. Theory & Wave Propagation:*** (8)
Module-4: ***Transmission Line Theory & Antennae:***(8)
Module-5: ***Analog Communication Principles:***(8)
Module-6: ***Digital Communication Principles:***(8)

Practical – ES 3: Basic Communication Engg.

E) ***Basic Computer Architecture & Organisation:***

Practical – ES 4: Basic Digital & Computer Engg Lab.

F) ***Environmental Science:***