

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SYLLABUS FOR F.Y.B.Sc. (WITH EFFECT FROM JUNE 1992)

ELECTRONICS

Approved syllabi of F.Y.B.Sc. :-

PAPER - I SECTION A (FIRST TERM)

Passive Electronic components and network theorems.

- 1] **RESISTORS** :- Symbol, colour code, types such as carbon, metal-film, thin-film, wire-wound, variable resistors (Logarithmic and linear potentiometer and presets) (06 periods)
- 2] **CAPACITORS** :- Symbol, colour-code, types such as paper, mica, tantalum, polystyrene, electrolytic, variable capacitors (gang and trimmer). (06 periods)
- 3] **INDUCTORS** :- Symbol, types such as air core, iron-core, ferrite core, chokes. (05 periods)

The study of above passive components should be as regards to
 - i) composition/construction/design
 - ii) range values
 - iii) practical limitations
 - iv) electrical properties
 - v) parameters/ ratings / specifications
 - vi) additional information.
 - vii) fields of applications.
- 4] **SWITCHES** :- Idea of SPDT, DPDT switches. Types such as toggle switch, rotary switch, relay as a switch (electromagnetic) (02 periods)
- 5] **NETWORKS** :- Tuned circuits (series and parallel resonant), coupled circuits (transformer coupled and doubly tuned), passive filters (low pass, high pass, band pass using R.L. and C.elements). (09 periods)
- 6] **NETWORK - THEOREMS** :- Kirchhoff's current and voltage laws. Thevenin's theorem, Norton's theorem, maximum power transfer theorem, superposition theorem. (8 Periods)

REFERENCE BOOKS

1. Understanding of electronic components : Walter
2. Electronic principles : V.K. Mehta
3. Basic electronics : B. Grob.
4. Basic Electronics : D.C. Tayal
5. Networks, lines & fields : J.D. Ryder (4th edn)
6. Electronic fundamentals and applications: J.D. Ryder
7. A monograph integrated electronics & circuits : Ketan & Goyal
8. Circuit Elements : Philips Publication

PAPER - I SECTION B (SECOND TERM) : DIGITAL ELECTRONICS

- 1] NUMBER SYSTEMS :- Decimal, Binary, Octal, Hexadecimal number systems, BCD code, Intercoversion of decimal, binary and hex numbers. (08 Periods)
- 2] LOGIC GATES :- Positive and Negative logic, OR, AND, NOT, NAND, NAND and EX-OR gates, Study of 7400, 7402, 7404, 7408 IC's [internal logic diagrams & pin connections] Diode logic, DTL, TTL and Emitter coupled logic, Basic building blocks of TTL gates, Multimeter input transistor inverter, Totem-pole and open collector outputs (10 Periods)
- 3] BINARY ARITHMETIC AND BOOLEAN ALGEBRA :- Binary addition and subtraction, 1's complement, 2's complement, Half and full-adders, Boolean axioms, De Morgan's theorems (statement, verification and application). (10 Periods)
- 4] FLIP-FLOPS :- R-S, clocked R-S J-K, Master slave J-K, D and T flip-flop (using logic gates). (06 Periods)
- 5] COUNTERS :- 4-bit binary counter, Decade counter, BCD counter. (04 Periods)

REFERENCE - BOOKS

1. Digital principles & applications : Malvino & Leach
2. Digital Electronics : R.P. Jain
3. Digital Electronics : Gothman
4. Digital Electronics : V.K. Jain
5. Digital Computer Electronics : A.P. Malvino

PAPER - II SECTION A (FIRST TERM) : SEMICONDUCTOR DEVICES

- 1] SEMICONDUCTORS :- Review of atomic structure, Formation of energy bands, Energy diagrams for conductors, Semiconductors and insulators, Charge carriers in semiconductors (Electron-hole pair), Intrinsic and Extrinsic semiconductors, Doping (P and N type semiconductors). (08 Periods)
- 2] P-N JUNCTION :- Junction diode, Depletion layer and barrier potential, Effect of forward and reverse bias on depletion layer and barrier potential, I-V characteristics, Junction diode as a switch and as a rectifier, Study of Zener diode, varactor diode, photodiode, LED (Symbol, biasing and applications). (06 Periods)
- 3] BIPOLAR JUNCTION TRANSISTOR (BJT) :- Principle of operation, CB, CE and CC configurations, Input, Output and Transfer characteristics for CE configuration, Relation between alpha and beta. (04 Periods)
- 4] UNI-JUNCTION TRANSISTOR (UJT) :- Basic working principle Characteristics and use as a switch and relaxation oscillator. (04 Periods)
- 5] FIELD EFFECT TRANSISTOR (FET) :- Basic working principle, characteristics, Pinch-off Voltage, use of FET as VVR, depletion and enhancement type MOS-FETs. (05 Periods)
- 6] SILICON CONTROLLED RECTIFIER (SCR) :- Four-layer diode, Characteristics, Use of SCR as a switch, Triac. (04 periods)

REFERENCE BOOKS

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| 1. | SOLID-STATE DEVICES | : Taper (Vol. I) |
| 2. | BASIC ELECTRONICS | : D.C. Tayal |
| 3. | BASIC ELECTRONICS FOR SCIENTISTS | : Jamesh J. Brophy |
| 4. | ELECTRONIC PRINCIPLES | : V.K. Metha |
| 5. | BASIC ELECTRONICS | : B. Grob |
| 6. | ELECTRONIC PRINCIPLES | : A.P. Malvino |
| 7. | SEMICONDUCTOR DEVICES | : Millman and Halkias |

PAPER - II SECTION B (SECOND TERM) : BASIC ELECTRONIC CIRCUITS

- 1] RECTIFIER CIRCUITS :- Half wave, Full wave and bridge rectifier circuits, capacitive filter, LC filters (capacitor input, choke input and LC filters), ripple factor, voltage doubler.
- 2] TRANSISTOR BIASING METHODS :- Fixed bias, Collector to base bias, and self-bias circuit. (04 Periods)
- 3] AMPLIFIER CIRCUITS :- single stage R-C coupled CE amplifier, AC & DC Load line, Operating point Thermal runaway, class A, class B and Class C amplifiers, crossover distortion, push-pull amplifier. (06 Periods)
- 4] OSCILLATOR AND MULTIVIBRATOR CIRCUITS :- Positive and negative feedback, Effects of negative feedback, Barkhausen criteria, Phase-shift oscillator, Astable, monostable and bistable multivibrators (transistorised). (08 periods).
- 5] DIFFERENTIAL AMPLIFIER CIRCUITS :- Black-box concept, common mode and differential mode, CMRR, Analysis of single ended and differential input. (03 Periods)
- 6] OPERATIONAL AMPLIFIER CIRCUITS (OP-AMP) :- Symbol, Ideal Characteristics, Inverting and Noninverting configurations, Virtual ground, Ic 741 pin connections (DIP and TO packages) and characteristics. OP-AMP as an adder, subtractor, differentiator and integrator. (06 periods).

REFERENCE - BOOKS :

1. Electronics principles - A.P. Malvino
2. Integrated Electronics - MILLMAN & HALKIAS
3. OP-AMP - G.B. CLYTON
4. Pulse, Digital & Switching waveforms Millman & Taub
5. Solid state Devices - Taper (volume - II)
6. Electronics Devices and circuits - Allen Mottershead.

PRACTICALS:

PAPER - III (FIRST TERM)

- i) Demonstration of electrical and electronic components R.L.C.transformer,choke,switches,relay,diode,BJT,UJT, FET etc. (Nomenclature types, ratings, etc.)
- ii) Use of analog and digital multimeters (measurements of R,voltage and current).
- iii) Use of Signal generator/function generator (measurement of o/p frequency/amplitude)
- iv) Use of CRO (measurement of freq./period and amplitude)
- v) Use of power-supply (Dual, fixed, variable and current limit)
 - 1] study of series and parallel resonance circuits.
 - 2] R-L filters and R.C.filters (low,high and band pass)
 - 3] Verification of Thevenin and Norton theorems and Maximum power transfer theorem.
 - 4] P-N junction characteristics.
 - 5] BJT characteristics.
 - 6] UJT characteristics.
 - 7] FET characteristics.
 - 8] SCR characteristics.

The above five exercises/experiment (i) to (v) should be regarded as prerequisite.

Paper-III (Second Term) :-

- 1] A)OR and AND gates using Diode logic and B)Study of logic gates (OR, AND,NOT,NAND,NOR) using various ICs (truth table verification)
- 2] Half-adder, full-adder circuits
- 3] verification of D'Morgan's theorems.
- 4] Study of flip-flops using various ICs.
- 5] Study of rectifier circuits with filters, calculations of ripple-factor.
- 6] Single stage R-C coupled amplifier (with and without-ve feedback)
- 7] A stable multivibrator (Transistorised)
- 8] OP-AMP (741) - parameters (o/p adm i/p impedance measurement)