Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING AND EXAMINATION

B.E. IV SEMESTER ELECTRICAL ENGINEERING

S.No.	Board of Studies	Subject Code	Subject	Periods per week			Scheme of Exam Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Electrical Engg.	324411 (24)	Electrical Engineering Materials	3			80	20	20	120	3
2	Electrical Engg.	324412 (24)	Electro Magnetic Fields	4	1		80	20	20	120	5
3	Electrical Engg.	324413 (24)	Electrical Network Analysis & Synthesis	3	1		80	20	20	120	4
4	Electrical Engg.	324414 (24)	Digital Electronics & Logic Design	3	1		80	20	20	120	4
5	Electrical Engg.	324415 (24)	Electrical Power System	4	1		80	20	20	120	5
6	Electrical Engg.	324416 (24)	Electrical Measurements & Measuring Instruments	3	1		80	20	20	120	4
7	Electrical Engg.	324421 (24)	Network Lab			3	40		20	60	2
8	Electrical Engg.	324422 (24)	Digital Electronics and Logic Design Lab			3	40		20	60	2
9	Electrical Engg.	324423 (24)	Electrical Power System I Lab			3	40		20	60	2
10	Electrical Engg.	324424 (24)	Electrical Measurements & Measuring Instruments Lab			3	40		20	60	2
11	Humanities etc.	300425 (46)	Health, Hygiene & Yoga			2			40	40	1
12			Library			1					
	Total			20	5	15	640	120	240	1000	34

**L – Lecture,   T – Tutorial, P – Practical,   ESE- End Semester Exam , CT- Class Test
TA – Teacher's Assessment**

Note (1) : Duration of all theory papers will be of **Three Hours.**

Note (2):   Industrial Training of six weeks is mandatory for B.E. student . It is to be completed in two parts. The first part will be in summer after IV sem. after which students have to submit a training report which will be evaluated by the college teachers during B.E. V sem.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   Branch: Electrical
Subject: Electrical Engineering Materials   Code: 324411 (24)
Total Theory Periods: 40   Total Tut Periods: 12
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I: Conductors
Classification: High conductivity, high resistivity materials, fundamental requirements of high conductivity materials and high resistivity materials, mobility of electron in metals, commonly used high conducting materials, copper, aluminum, bronze brass, properties, characteristics, constantan, platinum, nichrome, properties, characteristics and applications, materials used for contacts.

UNIT II: Semi-Conductors
General concepts, energy bands, types of semiconductors, Fermi Dirac distribution, intrinsic Semi-conductors, extrinsic Semi-conductors, hall effect, drift, mobility, diffusion in Semi-conductors, Semi-conductors and their applications, superconductors.

UNIT III: Dielectrics And Insulators
Properties of gaseous, liquid and solid dielectric, dielectric as a field medium, electric conduction in gaseous, liquid and solid dielectric, breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, effect of temperature on dielectric materials, polarization, loss angle and dielectric loss, petroleum based insulating oils, transformer oil, capacitor oils, properties, solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling and bounding materials, fibrous, film, mica, rubber, mica based materials, ceramic materials, classification of insulation (solid) and application in AC and DC machines.

UNIT IV: Magnetic Materials
Soft and hard magnetic materials, diamagnetic, paramagnetic and ferromagnetic materials, electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet, hystersis loop, hystersis loss, magnetic susceptibility, coercive force, curie temperature, magneto-striction.

UNIT V: Optical Properties of Solids
Photo emission, photo emission materials, electro luminescence junction diode, photo emitters, photo transistor, photo resistors, injunction lasers, optical properties of semiconductors, application of photo sensitive materials (CRT, Tube light, photo panels etc.).

Text Books:
1. "*Electrical Engineering Materials*",Dekker,PHI Pbs.
2. "*Electrical Engineering Materials*", Indulkar,S.Chand

Reference Books:
1. "*Electrical Engineering Materials*", Tareev
2. "*Electrical Engineering Materials*", Yu. Koritsky.
3. "*Electrical Engineering Materials*", R.K.Rajput, Laxmi Pbs.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV **Branch: Electrical**
Subject: Electromagnetic Fields **Code: 324412 (24)**
Total Theory Periods: 40 **Total Tut Periods: 12**
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I: Basics of Electromagnetic Fields
Scalars and vectors, vector algebra, the Cartesian, circular cylindrical and spherical coordinate systems, transformations between coordinate systems, Coulomb's law, electric field intensity, electric field due to several charges, Gauss law and its application, divergence and divergence theorem, Maxwell's first equation, the vector operator ∇ and divergence theorem.

UNIT II: Electrostatics
Electric potential, potential at any point due to discrete and distributed charges, principle of superposition potential and field between two coaxial cylinders, potential between two conducting spherical shells, conservative property, potential gradient, electric dipole, current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions for dielectric materials, boundary conditions for perfect dielectric materials, capacitance Poisson and Laplace equation, uniqueness theorem, examples of the solution of Laplace and Poisson's equations.

UNIT III: Magnetostatics
The steady state magnetic field, Biot Savart Law, Ampere's circuital Law, Curl, Stokes theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

UNIT IV: Magnetic Force And Inductance
Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, magnetic materials, magnetization and permeability, magnetic boundary conditions.

UNIT V: Time Varying Field And Maxwell's Equations
Modification of Maxwell's equations under time varying conditions, displacement current, source free wave equation, power flow and energy, sinusoidal time varying field, Helmholtz equation, complex pointing vector, Boundary condition, relation between field theory and current theory.

Text Books:
   1. "*Engineering Electromagnetics*", Hayt,TMH Pbs.
   2. "*Electromagnetic Field theory and transmission lines*", Raju, Pearson.

Reference Books:
   1. "*Principle And Application Of Electromagnetic Fields*", Robert Polnsey and Robert Collin.
   2. "*Fields and wave electromagnetics*", Chang.
   3. *Electromagnetic field, Bhat, CBS Pbs.*

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Electrical Network Analysis And Synthesis   **Code: 324413 (24)**
Total Theory Periods: 40   **Total Tut Periods: 12**
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I: Networks and Laplace Transform - I
Network equation, formulation of network equations, initial conditions in networks and network solution with Laplace transformation, step, ramp and impulse functions, initial and final value theorem and convolution integral.

UNIT II: Networks and Laplace Transform - II
Transform impedance and transform circuits, Thevenin's and Norton's theorem, duality, Fourier transform, discrete and continuous spectrum, relation and Laplace transforms.

UNIT III: Network Functions
Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions, two-port parameters, stability by Routh-Harwitz criterion.

UNIT IV: Network Synthesis
Identification of network synthesis, Brune's positive and real function (PRF), properties of PRF, testing of driving point functions, even and odd function, one terminal pair network driving point synthesis with LC elements, RC elements, Foster and Cauer form.

UNIT V: Filters
Low pass filters, high pass filters, band pass filters, band reject filters, Gain equalizer and delay equalizers, Butterworth filters, m-derived filters, constant k-filters, design of filters.

Text Books:
1. "*Network Analysis*", Valkenburg, PHI Pbs.
2. Circuit theory, Kurikose-PHI Pbs.

Reference Books:
1. "*Introduction To Network Synthesis*", Valkenburg, PHI Pbs.
2. "Network Analysis And Synthesis", Wadhwa, New Age Pbs.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV **Branch: Electrical**
Subject: Digital Electronics And Logic Design **Code: 324414 (24)**
Total Theory Periods: 40 **Total Tut Periods: 12**
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I: Number System and Codes
Number systems: Decimal, binary, hexadecimal, Octal number systems with mutual conversion, Binary arithmetic in computers BCD Addition, Subtraction
Binary code: Weighted and non-weighted codes, Error detecting and Correcting codes, ASCII Codes, Hamming Code, Alphanumeric Codes

UNIT II: Boolean algebra &Logic Gates
Development of Boolean algebra, Boolean logic operations, AND, OR, NOT, Universal building blocks, Basic laws of Boolean algebra, Demorgan's Theorem, Minterms & Maxterms, Deriving SOP & POS Expression from Canonical & standard form, Truth table, Karnaugh map (up to five variables), Minimization of logic function in SOP, POS and mixed term, Incompletely Specified functions, Multiple output, Minimization using Quine McClusky or Tabulation method.
Logic Gates**:** Positive and Negative Logic, Designation, OR, AND, NOT, NAND, NOR, XOR, XNOR, gates, Multilevel Gating Networks, NAND and NOR implementation, XOR and Equivalence function.

UNIT III: Combinational Circuits And Systems
Design procedure: Adder, Subtractor, Binary parallel adder, Serial adders, Decimal adders, and Fast adders, Multiplexers, Demultiplexers, Decoders, Encoders, Priority encoders, Parity generator/ checkers, Magnitude comparators, Code converters, Programmable logic array (PLA), ROM, Application of Multiplexers, Decoders and Comparators.

UNIT IV: Flip flop and its applications
Flip flop: Types, SR, JK, D and T type flip-flop, Triggering of Flip flops, Master Slave flip flop, Realization of one flip flop using other flip flops,
Registers and counters: Shift register, Bi-directional register, Asynchronous counter, Binary ripple counters, Asynchronous up-down counters, Synchronous up-down counter, Design of modulo-N synchronous counter, Ring counters, Sequence generator using counter.

UNIT V: Memory devices& Sequential machines
Classification of memories, semiconductor ROM and RAM, Organization of RAM,
Memory subsystem, Timing circuit, clock circuit and IC timer.
Design of synchronous sequential machines: Basic concepts, synchronous sequential machine models, design of synchronous sequential circuit, sequence detectors, odd/even parity generator, Basic concept, asynchronous sequential circuits, Design of fundamental mode of asynchronous sequential circuit by Flip flops

Text Books: 1. "Digital logic and concept design", Morris Mano, PHI Pbs.
                 2. "Study, theory and logic design" Jain, TMH

Reference Books:
1. "*An Introduction To Digital Computer Design*", V, Rajaraman and Radhakrishnan, 3rd Edition, PHI Pbs.
2. "*Digital Principles And Application*" Malvino & Leach, 4th Edition, McGraw Pbs.
3. "*Digital circuit and design*", Taub and Schelling, TMH.
4. Digital circuit and design, Salivahan and Aricozhagan, Vikas Pbs.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Electrical Power System   **Code: 324415(24)**
Total Theory Periods: 40   **Total Tut Periods: 12**
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I:
Over head lines: solid conductors, stranded conductors, bundled conductors, skin effect, proximity effects, inductance and capacitance of single-phase, three-phase single circuit and double circuit lines, concept of GMD, transposition of lines, effect of earth on capacitance of transmission lines.

UNIT II:
Transmission Lines: representation of transmission line, single line diagram, per unit quantity, Characteristics and performance of transmission lines, transmission lines as four terminal networks, nominal-T, nominal-π, equivalent-T, and equivalent-π representation of transmission lines, A, B, C, D constants, distributed parameters of long lines, hyperbolic solutions, Ferrantii effect, surge impedance loadings, power flow equations.

UNIT III: GENERATOR VOLTAGE
Generator voltage control, line drop compensation by static capacitors and reactors, induction voltage regulators, control of voltage profile, control of active and reactive power, calculation of synchronous phase modifier capacity, on-load tap changing transformer, control cost in AC and DC system, basis of selection for line voltage, AC and DC distribution systems, voltage drop calculation.

UNIT IV: CABLES
Types of cables, insulation resistance of cables, capacitance of cables, dielectric stress, capacitance grading of cables, use of inter-sheaths, power factor of cables, sag and tension calculation.

UNIT V: TRAVELING WAVES
Transients in power systems, wave equation, characteristic impedance, energy and power surge, velocity, traveling wave phenomenon in open circuited and short circuited lines, lines with series reactive termination, junction of two dissimilar lines, repeated reflections, Bewley's Lattice diagram.

Text Books:
1. "*Elements of Power Systems*", Stevenson, 4th Edition
2. "*Power System Engineering*", Nagrath Kothari, TMH Pbs.

Reference Books:
1. "*A Course In Electrical Power*", Soni, Gupta and Bhatnagar, Dhanpat Rai.
2. Electrical power systems, Ashfaq Hussain, CBS Pbs.
3. Electrical power systems, C. L. Wadhwa, New Age Pbs.
4. "Substation Design and Control" by Gupta & Satnam

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV **Branch: Electrical**
Subject: Electrical Measurements And Measuring Instruments **Code: 324416(24)**
Total Theory Periods: 40 **Total Tut Periods: 12**
Total Marks in End Semester Exam: 80
Minimum number of Class tests to be conducted: 2

UNIT I: Measurement Of Resistance
Classification of resistances (low, medium and high), measurement of resistance by volt drop method, loss of charge method, Wheatstone's bridge, Kelvin's double bridge, Megger and ohmmeter, AC Potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter).

UNIT II: AC Bridges
Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay's, Maxwell's, Anderson and Heaviside bridge and its modification, Wein's bridge for measurement of frequency, Wagner earthing device.

UNIT III: Detectors And Magnetic Measurement
Construction, theory and operation of D'Arsonval vibration galvanometer, flux meter, types of suspension method, measurement of BH flux by Lloyd Fisher Square and by CRO, determination of iron loss and permeability by AC potentiometer.

UNIT IV: Measuring Instruments
Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase electrodynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, ratio-meter type. Phase sequence meter, maximum demand indicator, tri-vector detector meter.

UNIT V: Power And Energy Measurement
Construction and principle of operation of dynamometer and induction type wattmeter, measurement of power in a three-phase circuit by using single-phase wattmeter, wattmeter errors, low power factor wattmeter, testing of wattmeter, single and poly-phase energy meters, testing of energy meters.

Text Books:
1. "*A Course In Electrical And Electronics Measurement And Instrumentation*", Sawhney, Dhanpat Rai Pbs.
2. "*Electrical Measurement And Measuring Instruments*", Golding, CBS

Reference books:
1. "*A Course In Electrical And Electronics Measurement And Instrumentation*", J. B. Gupta. Kataria Pbs.
2. "*Electric Measurements*", Harris.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Network Lab   Code: 324421 (24)
Total practical periods: 36
Total Marks in end Semester Exam: 40

List of experiments (minimum 10 experiments)

1) To verify sinusoidal steady state response of RC and RL network with step voltage input.
2) To verify sinusoidal steady state response of RLC network with step voltage input for under damped, critically damped and over damped cases.
3) To verify transient response of RC and RL network with step voltage input.
4) To verify transient response of RLC network with step voltage input.
5) To Verify Thevenin's Theorem in an A.C circuit.
6) To verify Norton's Theorem in an A.C circuit.
7) To verify Superposition Theorem in an A.C circuit.
8) Determination of Z and Y parameters (DC only) for a network.
9) Determination of h parameters (DC only) for a network.
10) Determination of image and characteristic impedance in T network using O.C test and S.C test.
11) Determination of image and characteristic impedance in π network using O.C test and S.C test.
12) Verification of parameter properties in inter-connected two port series networks.
13) Verification of parameter properties in inter-connected two port parallel networks.
14) Study of first order low pass and high pass Filters.
15) Study of Butterworth Filter.

Apparatus Required:
1. Bread Boards,
2. Resistors, Inductors, Capacitors,
3. CRO,
4. Function Generators, Multimeters,
5. Trainers/ Kits for the different experiments.

Reference Books:

1) "*Network Analysis*", Valkenburg, PHI Pbs.
2) Network Analysis And Synthesis", Kuo, JohnWiley Pbs.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Digital Electronics and logic design Lab   **Code: 324422 (24)**
Total practical periods: 36
Total Marks in end Semester Exam: 40
List of experiments (minimum 10 experiments)

1. To form basic logical OR gate having two or three inputs with   two or three diodes.
2. To form basic logical OR, AND, NOR & NAND gates using transistor.
3. To verification of Boolean expansion.
4. To design a 4-bit parity generator /detector circuits.
5. To design a half adder circuit.
6. To design a full adder circuit.
7. To design a half sub tractor circuit.
8. To design a full sub tractor circuit.
9. To converters decimal to binary using 4-input NAND gates (Encoder)
10. To demonstrate the operation and application of 16:1 digital multiplexer using IC's.
11. To Design a R-S flip flop.
12. To Design a D- flip flop.
13. To Design a J-K- flip flop.
14. To design an up/down synchronous counter
15. To study an 8-bit adder/sub tractor circuit.
NOTE: At least two design experiments must be fabricated and tested.

Apparatus Required:
1. DC power Supply
2. Toggle Switches
3. LEDs
4. Logic Gates
5. Diodes
6. Transistors
7. Bread board, multimeters
8. Clock

Reference Books:
1. Digital electronics- A.K. Maini
2. Digital Principal – Roger Ltokheim
3. Electronics Devices & circuit – Lnallen Motter shead.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Electrical Power System I Lab   **Code: 324423(24)**
Total practical periods: 36
Total Marks in end Semester Exam: 40

List of experiments (minimum 10 experiments)

1. Study of types of cables.
2. Study of types of Insulator used in power system
3. Study of Bus –bar arrangement of a power supply sub – station.
4. Study of Synchronous phase modifier and calculation of its rating.
5. To measure the A, B, C, D constants of transmission lines.
6. To measure the A, B, C, D constants of series transmission lines (HV-HV).
7. To measure the A, B, C, D constants of series transmission lines (LV-LV).
8. To measure the A, B, C, D constants of parallel transmission lines.
9. To locate faults in a cable by Murray loop test.
10. Measurement of capacitance between conductor –conductor and conductor –earth.
11. Comparison of conductor Characteristics (Self GMD) between two different groups of conductors.
12. To find out the rating of capacitor required for improving the power factor of an inductive load.
13. Study of Electrical power supply system.
14. Study of transmission structure used for different types of power supply system.
15. Study the lay out diagram of college power supply system.

Apparatus required: -
1. Transformer
2. Voltmeter
3. Ammeter
4. Multimeter, Wattmeter
5. Insulators
6. Synchronous motor
7. Capacitor, resistors, inductor
8. Power supply.

Reference Books: -
1. Power system analysis by C.L Wadhava, New Age
2. Power system analysis by V.K Mehta, S. Chand.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: IV   **Branch: Electrical**
Subject: Electrical Measurements & Measuring Instruments Lab Code: 324424(24)
Total practical periods: 36
Total Marks in end Semester Exam: 40

List of experiments (minimum 10 experiments)

1. To determine unknown resistance or value resistance by Kelvin Bridge Method.
2. To determine unknown resistance R by Wheatstone Bridge Method.
3. To determine unknown inductance of a given coil by Maxwell Bridge Method.
4. To determine the inductance of the given coil by Anderson Bridge Method.
5. To determine unknown capacitance of a given capacitor by Desauty Bridge Method.
6. To determine capacitance of a given capacitor by Schering Bridge Method.
7. To determine the inductance by Owen's Bridge Method.
8. To determine unknown inductance by Hay Bridge Method.
9. To calibrate a given single phase induction type Energy Meter.
10. To find the phase sequence of the supply by the rotating type phase sequence meter.
11. To find the phase sequence of the supply by the Static type phase sequence meter.
12. To determine the unknown resistance R by Voltmeter-Ammeter Method.
13. To observe the B-H curve and hysteresis loop of agiven transformer core on CRO.
14. Determine the iron losses by Lloyad fisher square method.
15. Measurement of high resistance by using Meggar.

Requirement:
1. Bridges
2. Oscillator.
3. Head Phone
4. Transformer, Variac
5. Voltmeter, Ammeter, Multimeters, Resistors
6. DC Supply
7. Lloyad Fisher Square
8. Meggar

Reference Book:
1. Electrical measurement & measuring instrument by A.K.Sawhney.
2. Electrical measurement & measuring instrument by Gupta

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester : B.E. IV Sem. Branch: Common for all branches
Subject   : **HEALTH, HYGIENE & YOGA** Code   : 300425 (46)
No. of Periods : 2 pds/week Tutorial Periods : NIL
Total Marks in End Semester Exam. : NIL Teacher's Assessment: 40 Marks
Minimum number of class tests to be conducted: Two

UNIT- I

HEALTH & HYGIENE: Concept of health, Physical health and mentall health and wellbeing and how to achieve these, longevity and how to achieve it, concept and common rules of hygiene, cleanliness and its relation with hygiene; Overeating and undereating, amount of food intake required, intermittent fasting; adequate physical labour, sleep; consumption of junk fast food vs nutritious food; fruits, vegetables cereals and qualities of each of these.

UNIT- II

INTRODRCTORY KNOWLEDGE OF COMMON STREAMS OF MEDICINAL CURE: History, development, basic concepts, modes of operation of Alopathy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accurpressure, Accupunture, Naturopathy, Yogic and Herbal system of medicines, Introduction of Anatomy and Physiology concerned.

UNIT- III

YOGASANS: Meaning and concept of Yoga, Yogasans and its mode of operation, How to perform Yogasans, Common Yogasans with their benefits, such as, Padahastasan, Sarvangasan, Dhanurasan, Chakrasan, Bhujangasan, Paschimottasan, Gomukhasan, Mayurasan, Matsyasan, Matsyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashankasan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra,

UNIT- IV

YOGASANS FOR COMMON DISEASES: From Yogic Materia Medica with symptoms, causes, asans and herbal treatment.

- ➢ **Modern silent killers**: High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomache disorders, such as, indigestion, acidity, dycentry, piles and fissures, artheritis, its causes, prevention and cure.

- ➢ **Asans for relaxation:** Shavasan, Makarasan, Matsyakridasan, Shashankasan.

- ➢ **Asans to increase memory and blood supply to brain** : Shirsh padasan, Shashankasan.

- ➢ **Asans for eye sight**: Tratak, Neti Kriya .

- ➢ **Pranayam** : Definition and types : Nadi Shodhan, Bhastrik, Shitakari, Bhramari useful for students.

UNIT V

CONCENTRATION: Concentration of mind and how to achieve it. Tratak ¼=kVd½] Concentration on breath, Japa ¼ti½] Ajapajap ¼vtikti½] internal silence ¼vUrekSZu½] visualization in mental sky ¼fpnkdk'k /kkj.kk½] Concentration on point of light ¼T;ksfr /;ku½] Concentration on feeling ¼Hkko /;ku½] Concentration on figure ¼ewÙkZ /;ku½-

REFERENCES

(1)   Yogic Materia Medica
(2)   Asan, Pranayam and Bandh

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