

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL
UNIVERSITY, BHILAI (C.G.)**

SEMESTER III CHEMICAL ENGINEERING

S. No	Board of Study	Subject Code	Subject	Period per week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Appl Mathematics	300311 (14)	Mathematics-III	4	1	-	80	20	20	120	5
2	Chemical Engineering	319312 (19)	Inorganic Process Technology	4	-	-	80	20	20	120	4
3	Chemical Engg..	319313 (19)	Industrial Process Calculations	3	1	-	80	20	20	120	4
4	Chemical Engg..	319314(19)	Applied Physical Chemistry	3	1	-	80	20	20	120	4
5	Mech Engg.	319315 (37)	Strength of Materials	3	1	-	80	20	20	120	4
6	Electronics & Telecom Engg.	320316 (28)	Electronics & Instrumentation	3	1	-	80	20	20	120	4
7	Chemical Engg.	319321 (19)	Basic Chemical Engg. Lab	-	-	3	40	-	20	60	2
8	Chemical Engg.	319322 (19)	Inorganic Process Technology Lab	-	-	3	40	-	20	60	2
9	Chemical Engg.	319323 (19)	Applied Physical Chemistry Lab	-	-	3	40	-	20	60	2
10	Mech. Engg.	319324 (37)	Strength of Materials-Lab	-	-	3	40	-	20	60	2
11	Humanities etc.	300325 (46)	Value Education	-	-	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

TA- Teacher's Assessment

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

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester **III Sem.**

Branch: Mechanical, Mining, Civil
And, **Chemical Engg.**

Subject : **MATHEMATICS-III**

Code : 300311 (14)

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Total Marks in End Semester Exam. : **80**

Minimum number of class test to be conducted: **02**

UNIT - 1 FOURIER SERIES

(No. of periods 8+2)

Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half range series, Harmonic analysis.

UNIT - 2 LAPLACE TRANSFORM

(No. of periods 8+2)

Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n , Division by t , Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT - 3 PARTIAL DIFFERENTIAL EQUATION

(No. of periods 8+2)

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT - 4 COMPLEX VARIABLES

(No. of periods 8+2)

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

UNIT - 5 STATISTICS

(No. of periods 8+2)

Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.

TEXT BOOKS: -

1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

REFERENCE BOOKS: -

1. Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N. Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan, Pune.
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: B E Third

Subject: Inorganic Process Technology

Total Theory Periods: 40

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code: 319312(19)

Total Tutorial Periods:00

Note: Internal choice may be given in any three units.

- UNIT I** Fundamental of inorganic process technology, Soda Ash, Caustic Soda, Salt Industries, Chlor - alkali industries, Br and Cl from sea water, Glauber Salts, Sodium Hypo Chloride, Problems related to industries.
- UNIT II** Sulfur , Sulfuric Acid Industries, Production of sulfuric acid by contact process , DCDA process , Chamber process , Production of alumina from Bauxite ore , Electrochemical industries , Use of Cl , Br, and I in industries
- UNIT III** Nitrogen Industries and Nitrogen Related compounds, Production of NH_3 , production of HNO_3 , Production of urea , production of ammonium sulfate, Fertilizer used in the industries.
- UNIT IV** Industrial Gases Acetylene (C_2H_2), Hydrogen by steam reforming process , production of O_2 and N_2 and uses of industrial Gases , Phosphorous and related compounds , Super phosphate fertilizer , Production of HCl
- UNIT V** Explosives (RDX, NH_3NO_3 , etc.), synthetic gas, Cement production, Ceramic Industries, Glass Industries, Refractory

Name of Text Books:

1. Dryden, Outline of Chemical Technology
2. G.N. Pandey, Chemical Technology Vol 1

Name of Reference Books:

1. Shreve, Austin G.T., Chemical Process Industries

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: B E Third

Subject: Industrial Process Calculations

Total Theory Periods: 30

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code: 319313(19)

Total Tutorial Periods: 10

Note: Internal choice may be given in any three units.

- UNIT I** Unit and its conversion, Normality, Molality, Molarity, PVT behaviors, Gas laws, Partial pressure and pure component volume methods. Limiting and excess reactant. [No. of classes: 6 + 2]
- UNIT II** Humidity and Saturation: Percentage Humidity, Relative Humidity, Molal Humidity, Cox Chart. Crystallization. [No. of classes: 6 + 2]
- UNIT III** Combustion calculations, Theoretical air & excess air requirement, flue gas analysis . [No. of classes: 6 + 2]
- UNIT IV** Material balance with and without chemical reactions, Recycle, bypass and purge operations. [No. of classes: 6 + 2]
- UNIT V** Energy Balance calculations:
Thermo physics: Heat capacity calculations, Enthalpy changes of reactions, Dissolution & laws of Thermo chemistry. Effect of Pressure & Temperature on heat of reactions. [No. of classes: 6 + 2]

Name of Text Books:

1. Bhatt and Vora, 'Stoichiometry', McGraw Hill Publications.
2. Hougen and Watson, "Chemical Process Principles Part – I Material and Energy Balance 2nd Edition

Name of Reference Books:

1. K A Gavhane, Unit operations, Nirali publication
2. Himmelblau, Basic Principles and Calculations in Chemical engineering, Pearson Education Pvt. Ltd.
3. Ghoshal, Sanyal, Dutta, Introduction to Chemical Engineering

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: B E Third

Subject: Applied Physical Chemistry

Total Theory Periods: 30

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code: 319314(19)

Total Tutorial Periods: 10

Note: Internal choice may be given in any three units.

Unit I SOLID STATE:

Elementary Ideas of Crystalline state, shapes, Lattices Unit cells, Crystal Planes, X-Ray and Crystal Structure, Bragg's Equation. Structure of Solids, Non- Metals and Simple Inorganic Compounds. Isomorphism, Heat Capacity of Solids, Solution of Gases in Liquid, Influence of Pressure Henry's Law, Raoult's Law, Lowering of Vapor Pressure and Elevation of Boiling Points. [No. of classes: 6 + 2]

Unit II OSMOSIS AND OSMOTIC PRESSURE:

Determination of Osmotic Pressure by Berkley & Hartley's Method and Moss and Frazer's Method. Semi permeable Membrane and its Mechanism, Ideal and Non Ideal Solution, Osmotic Pressure and Pressure Relationship, Abnormal Osmotic Pressure, Activity and activity Coefficient, Vapor Distillations of Liquid Mixtures [No. of classes: 6 + 2]

Unit III PHASE RULE:

One Component System, Water system, Sulfur System, Two Component System, Salt Hydrates (Fe Cl₂-water & NaSO₄), Distribution Law.

ADSORPTION:

Adsorption of Gases, Types of Adsorption, Langmuir's Adsorption isotherm, physical Adsorption isotherms. Gibb's Equation, Applications of Adsorption. [No. of classes: 6 + 2]

Unit IV ELECTROCHEMISTRY:

Conductance of Electrolytes, Laws of Electrolysis & its Significances, Migration of ions, Transference Numbers and its determination, Equivalent Conductance and its Measurement, E.m.f. and its Measurement, Reversible Electrode, reaction in reversible Cells, Free energy changes in cells, Reversible electrode potential, Proton transfer theory, ionization constant, ionic product of water, pH – Scale and Buffer solution, Theory of Indicator. [No. of classes: 6 + 2]

Unit V PHOTOCHEMISTRY:

Lambert's Law, Grothaus - Draper Law, Einstein's Law of Photo-Chemical Equivalence, Photochemical reaction, Dissociation of HI and Photochemical reaction of H and Cl.

NUCLEAR CHEMISTRY:

Radio Activity, Detection of Ionizing Radiation, Group displacement law, Determination of rate of radioactive disintegration, radio- active series. Isotopes and their separation, Artificial nuclear reactions [No. of classes: 6 + 2]

Name of Text Books

1. Samuel Glasstone, Text Book of Physical Chemistry
2. Gurdeep Raj, Advanced Physical Chemistry

Name of Reference Books:

1. Leidler, Text Book of Physical Chemistry
2. Puri and Sharma, Advanced Physical Chemistry
3. Bahl & Bahl, Essentials of Physical Chemistry.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI
(C.G.)**

Semester: B.E. III sem.

Branch: Chemical engineering

Sub: STRENGTH OF METERIALS

Code: 319315 (37)

Total Theory Periods: 40

Total Tutorial Periods: 10

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted :02

Unit : 1

Basic Concepts of stress & Strain

Stresses & Strain at a point, stress- strain curve, Hooke's law, elastic limit, yield stress, ultimate stress, working stress, factor of safety, lateral strain, Poisson's ratio, shear stress and strain, complimentary shear stresses, modulus of rigidity, bulk modulus, statically indeterminate stresses, assembly and thermal stresses in composite systems for tension and compression,

Unit-II

Principal Stresses and Principal Strains for two-dimensional compound stresses, Mohr's circle of stress.

Behaviour of brittle and ductile material under tensile, compressive and impact test. Hardness test, Bending test an modulus of rupture.

Unit – III

Bending stresses in beams (made of one material only)

Theory of bending, section modulus, use of steel tables for properties of rolled steel sections.

Deflection of beams, using double integration method

Symmetrically loaded simply supported beams, Simple cases of cantilevers.

Unit – IV

Riveted joints in plates and truss-joints

Nominal and gross diameter, strength and efficiency, Pitch, Rivet value (Axial loads only)

Welded joints

Types, size, throat, reinforcement and effective length, strength of butt and fillet welds (excluding eccentrically loaded brackets)

Long Columns and Struts

Various end conditions, Euler's and Rankine's formula (axial loads only) simple built-up sections. Use of table of allowable stress, according to IS:800

Unit-V

Stresses and Strains in thin cylindrical and spherical shells subjected to internal pressure (excluding wire- wound and compound cylinder)

Stresses in walls of thick cylinders under internal pressure (excluding compound cylinders).

Lame's equations.

TEXT BOOKS

1. Strength of Materials – S. Ramamrutham
2. Strength of Materials – Sadhu Singh

REFERENCE BOOKS

1. Strength of Materials – B.C. Punmia
2. Strength of Materials – R.K. Rajput
3. Elements of Strength of Materials – Timoshenko and young
4. Mechanics of Materials – F. Singer

**CHHATTISGARH SWAMI VEVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: B.E. Illrd Sem.

Branch: Chemical, Civil and
Mechanical Engg.

Sub: **Electronics & Instrumentation**

Code: 320316 (28)

Total Theory Periods: 40

Total Tutorial Periods: 10

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 02

Unit – I : Semiconductor Diodes

Construction & Characteristics of PN Junction diodes, Rectifier: Half wave, Full Wave & Bridge (Circuit and operation), Zener diode: construction, characteristics, specifications, Voltage regulator circuit using Zener diode.

Unit – II : Transistors

(8L + 2T)

Junction Transistor : Construction, Various current components inside a transistor, circuit symbol of PNP and NPN transistors, transistor amplifier, input and output characteristics, relation between α and β of a transistor, CB, CE & CC configuration. Field Effect Transistor: construction, principle of operation and characteristics of JFET. Construction, principle of operation and characteristics of MOSFET 0 enhancement and depletion type MOSFET.

Unit – III : Basics of Transducers

(8L + 2T)

Active & Passive Transducers, Analog & Digital Transducers, Classification of transducers according to Applications. Selection of a transducer. Construction, Principles of operation and applications of : Wire wound Potentiometer, Strain gauge, LVDT, Thermistor, Solar cell Transducer, Piezo-electric crystals.

Unit – IV : Signal Conditioning Circuits

(8L + 2T)

Operational Amplifiers: Terminal characteristics, Ideal characteristics, OPAMP as Inverting amplifier, Non-inverting amplifier, Adder, Difference amplifier, differentiator, Integrator, Comparator, Instrumentation amplifier. *Passive Filters*: High Pass, Low Pass and Band Pass filter using RC- expression for their Gain – BW Product. *Wheatstone bridge*. *Diode Clipper and clamper* (only qualitative analysis, no mathematical derivation is required).

Unit – V : Basic Instrumentation System & Components

(8L + 2T)

Block diagram of basic measurement systems: Distortion due to Mechanical loading, Distortion due to Impedance loading, Distortion due to change in signal frequency, Distortion due to electrical noise. *Data Acquisition System*: Objective of DAS, Single & Multi channel DAS, Computer based DAS. Data Loggers, (Only introductory idea is expected no detail analysis is required).

Text Books :

1. *Electronic Instrumentation* (2nd Ed.) by H S Kalsi, TMH
2. *Elements of Electronic Instrumentation* by J. Jha, M.Puri, R. Sukesh Kumar & M. Kowar, Narosa Publishing House.
3. *Electronics & Instrumentation* by B.R. Gupta, S. Chand & Co.

Reference Books :

1. *Electrical & Electronics Measurement & Instrumentation* by A.K. Sawheny, Dhanpat Rai Publishing Company.
2. *Electronic Instrumentation & Measurement Techniques* by Copper & Helfrick, PHI.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: Third

Branch Chemical Engg

Subject: Basic Chemical Engg Lab

Practical Code 319321(19)

Total Practical Periods: 36

Total Marks in End Semester Exam: 40

Experiments to be performed (Minimum 10 experiments)

- (i) Study of plate Column
- (ii) Study of Packed Column
- (iii) Study of Wetted wall Column
- (iv) Study of Fluidized bed column
- (v) Study of Roll Crusher
- (vi) Study of Ball Mill
- (vii) Study of Rod Mill
- (viii) Study of Jaw Crusher
- (ix) Study of Double Pipe Heat Exchanger
- (x) Study of Shell and Tube Heat Exchanger
- (xi) Study of Evaporator Single and Multiple effect
- (xii) Study of Wiers and Notches
- (xiii) Study of Orifice meter and Venturi meter
- (xiv) Study of dryers
- (xv) Study of crystallizes

List of Equipments/Machines Required

- (i) Pplate Column
- (ii) Packed Column
- (iii) Wetted wall Column
- (iv) Fluidized bed column
- (v) Roll Crusher
- (vi) Ball Mill
- (vii) Rod Mill
- (viii) Jaw Crusher
- (ix) Pipe Heat Exchanger
- (x) Tube Heat Exchanger
- (xi) Evaporator Single effect
- (xii) Evaporator Multiple effect
- (xiii) Wiers and Notches
- (xiv) Orifice meter and Venturi meter
- (xv) dryers
- (xvi) crystallizes

Recommended Books:

1. McCabe Smith, Unit Operations in Chemical Engg., 3ed Ed., McGraw Hill.
2. Badger and Banchemo , Unit Operations.
3. Andrews and Williams, Applied Instrumentation in Process Industries.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: B.E. Third

Branch: Chemical Engg

Subject: Inorganic Process Technology Lab

Practical Code: 319322(19)

Total Practical Periods: 36

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

1. Determine the percentage % purity of H_2SO_4 of given acid sample
2. Determine the percentage % composition of NaOH and Na_2CO_3 sample
3. Determination of percentage silica present in the given Cement sample
4. Determination of the moisture present in the cement sample
5. Determination of the combustion loss in the cement sample
6. Determination percentage % Cu present in the given Copper Sulphate sample
7. Determination of the hardness of the water sample
8. Determination of percentage of lime present in the cement sample
9. Determination of % Ca in given Dolomite sample
10. Determination of % Mn in given Pyrolusite sample.
11. Determination of % Ca in given Lime stone sample.
12. Determination of % silica in given Ash sample.
13. Determination of N in given fertilizer sample
14. Determination of P in given fertilizer sample
15. Determination of K in given fertilizer sample

List of Equipments/Machines Required

- (i) Weighing Balance
- (ii) Muffle Furnace
- (iii) Water Bath
- (iv) Hot Air Oven
- (v) Heating Mental
- (vi) Silica Crucible

Recommended Books:

- 1 Outlines of Chemical Engineering – Dryden
- 2 Experimental Chemistry – S.S. Dara

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: Third

Branch Chemical Engg

Subject: Applied Physical Chemistry Lab

Practical Code 319323(19)

Total Practical Periods: 36

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

1. .To determine the relative viscosity of the given liquid at room temperature.
2. To determine the % composition of the given mixture containing two components A & B by Viscosity Method.
3. To determine the surface tension of the given liquid at definite temperature.
4. To determine the % composition of the given mixture consisting two components by surface method.
5. To determine the solubility of Benzoic Acid at different temperature and to draw the solubility curve.
6. To determine the solubility of Salicylic Acid at different temperature.
7. To investigate the adsorption of Acetic Acid by activated charcoal.
8. To investigate the adsorption of Oxalic Acid by activated charcoal.
9. To determine the partition coefficient of Benzoic Acid between water and CCl_4 at room temperature.
10. To determine the partition coefficient of Solute (Iodine) between Solvent (water) and Organic Solvent CCl_4 at room temperature
11. Study of hydrolysis of Ester such as Methyl Acetate catalyzed by an acid.
12. Study of hydrolysis of Ester such as Ethyl Acetate catalyzed by an acid.
13. To determine the molecular weight of given liquid by Victor-Mayer Method.
14. To study the variation in boiling point of a solution with concentration.
15. To draw solubility curve for a given salt sample.

List of Equipments/Machines Required

1. Viscometer
2. Thermostat
3. Calorimeter
4. Separating Funnel
5. Electronic Balance
6. Water bulk with temperature controller
7. PH meter and conductivity meter.

Recommended Books:

1. Samuel Glasstone, Text Book of Physical Chemistry
2. Gurdeep Raj , Advanced Physical Chemistry
- 3 Laidler, Text Book of Physical Chemistry
4. Puri and Sharma, Advanced Physical Chemistry
- 5 Bahl & Bahl, Essentials of Physical Chemistry.
- 6 Dara.S.S., Practical Chemistry

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester : B.E. III sem.

Branch : Chemical Engineering

Sub : **STRENGTH OF MATERIALS LAB**

Code : 319324 (37)

Total Theory Periods : 20

Total Marks in End Semester Exam : 40

EXTERIMENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)

1. To study the Universal Testing Machine.
2. To perform the tensile Test of Mild Steel on U.T.M. and To Draw Stress-Strain Curve.
3. To determine strength of wood on U.T.M. (i) Along the Grain (ii) Across the Grain.
4. To determine shear strength of Mild Steel on U.T.M.
5. To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M.
6. To study the Impact Testing Machine and test specimen of Izod and Charpy tests.
7. To determine Izod and Charpy Value of the given mild steel specimen.
8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.
9. To study the Spring Testing Machine.
10. To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine.
11. To study the Torsion Testing Machine
12. To determine ultimate shear stress and modulus of rigidity under Torsion.
13. To study the Cupping Test Machine and to determine Erichsen value of Mild Steel Sheet.
14. To study the Rockwell Harness Testing Machine and to determine the Rockwell Hardness of the given material.
15. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
16. To study the Vickers Hardness Machine and to conduct a test on the machine.
17. Buckling of column.

LIST OF EQUIPMENTS/ MACHINES REQUIRED

1. Universal Testing Machine
2. Impact Testing Machine
3. Fatigue Testing Machine Spring Testing Machine
4. Torsion Testing Machine
5. Torsion Testing Machine
6. Cupping Testing Machine
7. Rockwell Hardness Testing Machine
8. Brinell Hardness Machine
9. Vickers Hardness Machine
10. Column Testing Machine

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester : B.E. 3rd Sem. Branch : Common to all Branches
Subject : **Value Education** Code : 300325 (46)
No. of Periods : 2 pds/week Tutorial Periods : NIL
Total Marks in End Semester Exam. : NIL Teacher's Assessment : 40 Mks
Minimum number of class test to be conducted : Two

Unit – I

- **STUDY OF BASIC HUMAN OBJECTIVES:** Everlasting solution (समाधान), prosperity (समृद्धि), trust in self and others (अभय), and coexistence (सहअस्तित्व) for balance in nature. Need and importance of aforesaid basic human objectives and how to achieve these.

Unit – II

- **CONCEPT AND UNDERSTANDING OF HUMAN HAPPINESS**

Meaning and concept of "happiness", incessant happiness, its relationship with guarantee of physical needs, comforts, physical and sensory pleasures with its transient nature, misery; The only method to minimize incessant happiness : gaining right understanding about oneself, one's body, one's relationship with other human beings, Nature and total existence.

Unit – III

- **PROPER UNDERSTANDING** about the order in Nature (व्यवस्था) and co-existence (सहअस्तित्व) at various levels, such as, I and my body, family, society, Nature and existence.
- **UNDERSTANDING THE SELF :** Understanding human reality – I and my body, present understanding of the self, physical needs, relation with others and with Nature, gaining proper understanding of the self, discrimination between 'I' and my 'body', characteristics and the needs of 'I', of my 'body' and 'body' & 'I'.

Unit – IV

- **SYNERGATIC ORDER (व्यवस्था) and COEXISTENCE (सहअस्तित्व) among HUMANS, IN NATURE & IN EXISTENCE :**
 - Conceptual understanding of natural relations and consequent values, of family and relation therein, of society and role of engineers therein, overall excellence' : concept, its universal parameters and total human behaviour
 - Inanimate (जड़) and consciousness (चैतन्य) aspects of Nature, Four distinct synergetic orders in Nature - Padaarth Awastha (पदार्थ अवस्था), Pran Awastha (प्राण अवस्था), Jiv Awastha (जीव अवस्था), and Gyan Awastha (ज्ञान अवस्था), complementary supplementary evolutionary connection amongst above orders, identifying and implementing "Appropriate Technology".
 - Synergetic order among interacting entities of Nature operating in all pervading changeless Shunya or Satta, Indivisible interconnectedness of Satta and Prakriti and its implications.

Unit – V

• IMPLICATIONS OF PROPER UNDERSTANDING

- Awakening (जागृति), the common goal of all human beings,
- promotion and perseverance of synergetic order and co-existence at all levels leading to incessant happiness.
- Natural manifestation of universal human values and thereby incessant happiness
- Undivided Society (अविभाज्य समाज) and Universal Organised System (सार्वभौम व्यवस्था)
- Transition from synergetic disorder (अव्यवस्था) to synergetic order (व्यवस्था)
- Evaluation of Understanding, work and behaviour.

REFERENCES

1. Jeevan Vidya Camp (शिविर) notes
2. An Introduction to Jeevan Vidya by Shri A. Nagaraj
