

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

SCHEME OF TEACHING AND EXAMINATION

B.E. III SEMESTER MECHATRONICS ENGINEERING

S. No.	Board of Study	Sub. Code	SUBJECT	PERIODS PER WEEK			SCHEME OF EXAM Theory/Practical			TOTAL MARKS	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1.	Applied Mathematics	328311 (14)	Mathematics - III	4	1	-	80	20	20	120	5
2.	Mech. Engg.	337315 (37)	Fluid Mechanics	4	1	-	80	20	20	120	5
3.	Mech. Engg.	367311(37)	Strength of Materials	4	1	-	80	20	20	120	5
4.	Information Technology	333312(33)	Digital Electronics & Logic Design	4	1	-	80	20	20	120	5
5.	Electronics and Telecom.	328313 (28)	Basic Electronics	4	1	-	80	20	20	120	5
6.	Electronics and Telecom.	328316 (28)	Programming with C	3	1	-	80	20	20	120	4
7.	Electronics and Telecom.	328322 (28)	Basic Electronics Lab	-	-	2	40	-	20	60	1
8.	Mech. Engg.	337323 (37)	Fluid Mechanics Lab	-	-	2	40	-	20	60	1
9.	Information Technology	333323(33)	Digital Electronics & Logic Design Lab	-	-	2	40	-	20	60	1
10.	Electronics and Telecom.	328323 (28)	Programming with C Lab	-	-	2	40	-	20	60	1
11.	Humanities	300325(46)	Value Education	-	-	2	-	-	40	40	1
12.			Library	-	-	1	-	-	-	-	-
			Total	23	6	11	640	120	240	1000	34

L – Lecture, T – Tutorial,

P – Practical, ESE- End Semester Exam, CT- Class Test, TA – Teacher's Assessment

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

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **B.E. III Sem.**

Branch: **Electronics & Telecom., Applied
Electronics & Instrumentation,
Mechatronics Engg.**

Subject: **Mathematics-III**

Code: **328311 (14)**

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 FOURIER SERIES

(No. of periods 8+2)

Periodic functions, Definition of Fourier series, Euler's formulae, Dirichlet conditions, Change of interval, Even and odd functions, Half range Fourier Sine & Cosine series, Parseval's identity, Practical harmonic analysis.

UNIT - 2 FOURIER TRANSFORM

(No. of periods 8+2)

Definition of Fourier integrals – Fourier Sine & Cosine integrals, Complex form of Fourier integral, Fourier Sine & Cosine transforms, Complex form of Fourier transform, Linearity, shifting & scaling properties, Modulation theorem, Inverse Fourier transform, Fourier transform of derivatives.

UNIT – 3 LAPLACE TRANSFORM

(No. of periods 8+2)

Definition, Linearity, shifting & scaling properties, Transform of elementary functions, Transform of derivatives and integrals, Multiplication by t & division by t . Inverse Laplace transform, Convolution theorem, Transform of periodic functions, Unit step function & Dirac delta function, Initial value & final value theorems, Application to solution of ordinary differential equations.

UNIT - 4 COMPLEX VARIABLES

(No. of periods 8+2)

Limit, Derivative, Analytic function, Cauchy-Riemann equations, Harmonic functions, Application to flow problems. Complex integration, Cauchy's integral theorem and integral formula, Taylor's & Laurent's series, Singular point, Poles & residues, Residue theorem & its application to contour integration.

UNIT – 5 CORRELATION AND REGRESSION

(No. of periods 8+2)

Linear correlation, Measures of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, Bivariate frequency distribution, Regression, lines of regression & coefficients of regression, Standard error estimate.

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.
1. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester	:	B.E. III Sem.	Branch	:	Mechanical Engg., Mechatronics Engg.
Subject	:	FLUID MECHANICS	Code	:	337315 (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 I

Properties of fluid

Fluid, ideal and real fluid, properties of fluid : mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus.

Newtonian and non-Newtonian fluids

Fluid Statics

Pressure, Pascal's law, Hydrostatic law, Pressure measurement, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation, Liquid in relative equilibrium.

UNIT – II

Fluid Kinematics

Description of fluid motion, Lagrangian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function, flow net, its characteristics and utilities.

UNIT – III

Fluid Dynamics

Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube. Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor, Vortex motion, Radial flow.

UNIT – IV

Laminar Flow

Reynold's experiment, shear stress and pressure gradient relationship, flow of viscous fluids in circular pipe, and between two parallel plates, Couette flow.

Turbulent flow

Effect of turbulence, friction loss in pipe flow, shear stress, velocity distribution.

Flow through pipe

Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.

UNIT – V

Dimensional Analysis

Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations.

Model analysis

Dimensionless number and their significance, model laws, Reynold's model law, Froude's model law, Euler's model law, Weber's model law, Mach's Model law, Type of models, scale effect in model, limitation of hydraulic similitude.

TEXT BOOKS

1. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons – New Delhi
2. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi

REFERENCES BOOKS

1. Fluid Mechanics – A.K. Mohanty – Prentice Hall Pub.
2. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH
3. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)

Chhattisgarh Swami Vivekanand Technical University, Bhilai(C.G.)

Semester: **B.E. III Semester**
Subject: **Strength of Materials**
Total Theory Periods: **40**
Total Marks in End Semester Exam: **80**
Minimum number of class tests to be conducted: **02**

Branch: **Mechatronics Engineering**
Code: 367311(37)
Total Tutorial Periods: **10**

UNIT I

Introduction: Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke's law, stresses in the components subjected to multi-axial forces, temperature stresses, statically indeterminate systems.

UNIT II

Bending of Beams: Bending of Beams with symmetric section, boundary conditions, pure bending, bending equations, Transverse shear stress distribution in circular / hollow circular / I & T section.

Deflection of Beams: Relation between slope deflection & radius of curvature, solution of beam deflection, problems by Macaulay's Method, Direct integration method, Moment Area method, Method of Super position.

UNIT III

Torsion: Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft.

Spring: Closed & Open Coil Helical Springs subjected to Axial Load, Springs in parallel & series.

UNIT IV

Energy Methods: Introduction, principles of superposition, strain energy, reciprocal relations, elastic strain energy relation in tension and compression, strain energy in beams subjected to bending and shaft to torsion. Impact loading in tension and bending, first theorem of Castigliano and its applications

UNIT V

Fixed Beams: Fixed beam subjected to different types of loads and couples.

Continuous beams: Continuous beams subjected to different type of loads and couples.

TEXT BOOKS

1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
2. Elements of Strength of Material – Timo Shenko & Young – EWP Press
3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS

1. Strength of Material – Rider – ELBS
2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
3. Mechanics of Material – J.M. Gera & Timoshenko – CBS Publishers
4. Introduction to Solid Mechanics – I. H. Shames – PHI
5. Engineering Mechanics of Solids – E.P. Popov – PHI
6. Strength of Material – Shaums Outline Series – McGraw Hill

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semster : B.E. III Sem.

**Branch : Information Technology,
Mechatronics Engg.**

Subject : Digital Electronics and Logic Design

Code : 333312(33)

Total Theory Periods : 40

Total Tutorial Periods : 10

Total Marks in end semester examination : 80

Minimum number of class tests to be conducted : 02

UNIT-I

Overview of Boolean Algebra AND Logic Gates : Number Systems and Codes, Binary Arithmetic, Boolean Algebra, Minimisation of Switching Function, Demorgan's Theorem, Karnaugh's Map Method (limited up to 4-variables), Quine McCluskey's Method, Cases with Don't care conditions and multiple output switching functions.

UNIT-II

Combinational Circuits : NAND / NOR gates, Realisation of switching functions, Half/full adders, Half / full subtractors, Series and parallel additions, BCD adders, Look ahead carry generators, Decoders and encoders, BCD to 7 segment decoders, Multiplexers and Demultiplexers, Parity bit generator and detector, Error detection.

UNIT-III

Logic Families and Flip Flops : RTL, DTL, all types of TTL circuits, ECL, Basics & Features of I^2L and PMOS, NMOS and CMOS logic etc., Flip-Flops and their conversion, Excitation Tables.

UNIT-IV

Sequential Circuits : Introduction to registers and Counters : Synchronous and Asynchronous counters and Designing of sequential circuits: code converter and counters. Mod-k and divide by K Counters, Counter Applications.

UNIT-V

Memories and Converters : Introduction to various semiconductor memories and designing of ROM and PLA, Introduction to analog to digital and digital to analog converters and their types (R-2R ladder network and successive approximation converters)

Name of Text Books

1. R. P. Jain : "Modern Digital electronics", TMH
2. B. Somanathan Nair, "Digital Electronics & Logic Design", Prentice-Hall of India

Name of Reference Books :

1. R J Tocci, "Digital System principles and Applications"
2. W H Gothman, "Digital Electronics" PHI
3. M.M. Mano : "Digital design", PHI.
4. Millman Taub, "Pulse, Digital and Switching Waveforms" TMH
5. M.M. Mano : "Digital logic and computer design", PHI.
6. Floyd : "Digital fundamentals", UBS.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : **B.E. III Sem.**

Branch: **Electronics & Telecommunication,
Mechatronics**

Subject: **Basic Electronics**

Code: **328313 (28)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Total Marks in End Semester Examination: **80**

Minimum number of Class tests to be conducted: **Two**

Unit – I

Introduction, Transport Phenomena in semiconductor, Formation of P-N Junction, Properties of P-N Junction, P-N Junction Diodes; Semiconductor Diodes, V-I Characteristics, Effect of Temperature on V-I Characteristics, Ideal Diode, Diode equation, Diode Resistance, Diode Capacitance: Transition and Diffusion Capacitance.

Unit – II

Rectifying circuits and DC Power Supplies: Load line analysis of diode circuit, Half wave rectifier: Voltage regulation, Ripple factor, ratio of rectification, Transformer Utilization factor. Full wave rectifier, Bridge rectifier. Filter circuits for power supply: Inductor filter, Capacitor filter, LC filter, Multiple LC filter, CLC or π filter. Zener diode: Break down mechanism, Characteristics, Specifications, Voltage regulator circuit using zener diode.

Unit - III

Transistor: Introduction, Construction, Types: npn and pnp, Current components. Transistor as an amplifier, Transistor Characteristics, Transistor Circuit Configuration: Common Base (CB) Configuration, Common Emitter (CE) Configuration, Common Collector Configuration (CC), Early Effect. Ebers-Moll Model, Maximum Voltage Ratings.

Unit – IV

Transistor Biasing and Thermal stabilization: The operating point, Bias stability, Stability factor, Emitter bias, Collector – to – base bias, Voltage divider bias with emitter bias, Emitter bypass capacitor. Bias compensation.

Unit – V

Field Effect Transistor (FET): Introduction, Construction, Operation, V-I Characteristics, Transfer Characteristics, Drain Characteristics, Small-Signal Model.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): Introduction, Construction, Operation and characteristics, Depletion MOSFET, Enhancement MOSFET.

Name of Text Books:

1. Integrated Electronics: Analog & Digital Circuit Systems – Jacob Millman & Halkias, TMH.
2. Electronic Devices & Circuits – Allen Mottershead, PHI.

Name of Reference Books:

1. Electronic Devices and Circuit Theory – Boylestad & Nashelsky, 8th Ed. PHI.
2. Electronic Devices & Circuit Analysis – K. Lal Kishore, BS Publications

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : **B.E. III Sem.**

Branch: **Electronics & Telecommunication,
Mechatronics**

Subject: **Programming with C**

Code: **328316 (28)**

Total Theory Periods: **30**

Total Tutorial Periods: **10**

Total Marks in End Semester Examination: **80**

Minimum number of Class tests to be conducted: **Two**

Unit - I

Introduction to C Language : history and development .C compilers. Data types, types of instructions, input/output functions. Operators , precedence and associativity of operators. Type casting, Developing simple programs , compilation , debugging and testing of programs. Relevance of C language.

Unit - II

Conditional constructs: if statement, if-else statements, nested if-else, forms of if. Conditional operator, Switch case construct. Loop control structures, nested loops, break and continue statements. goto statement.

Arrays : Syntax and definition, one and multidimensional arrays, reading and writing an array. Pointers and arrays.

Unit - III

Functions: Declaring and defining functions ,storage classes ,call by value, introduction to pointer data type ,call by reference, using library functions in programs, macro definitions. Preprocessor directives - #if, #elif, #define etc. Passing arrays into functions. Recursion.

Unit - IV

Strings: reading and writing strings, passing a string into a function, using library functions to manipulate strings. Array of strings.

Structures: Declaring and using structures. Array of structures, passing structures into function. Unions and enums, Pointers to structures Bit fields.

Unit - V

File Handling : reading and writing text files through C programs . File manipulating functions : fputc, fgetc, fgets, fputs, fseek, ftell etc. Working with Binary files , fread and fwrite. Command line arguments. Bitwise operators in C.

TEXT BOOKS

1. Let us C – Yashwant Kanetkar , BPB Publication
2. Programming in ANSI C – E. Balaguruswamy Tata Mc-Graw Hill

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : **B.E. III Sem.**

Branch: **Electronics & Telecommunication,
Mechatronics**

Subject: **Basic Electronics Lab**

Code: **328322 (28)**

Total Practical Periods: **36**

Total Marks in End Semester Examination: **40**

Experiments to be performed (Minimum 10 experiments)

1. To draw the characteristics of a semi conductor diode and to find cut-in voltage, reverse resistance, static resistance and dynamic resistance.
2. To draw the characteristics of a zener diode
3. To design a half wave rectifier and to determine its efficiency and ripple factor.
4. To design a- full wave rectifier and determine the ripple factor and efficiency with filter.
5. To design a- full wave rectifier and determine the ripple factor and efficiency without filter.
6. To draw the characteristics of FET using BFW – 10
7. To draw the characteristics of CE configuration of a transistor amplifier.
8. To draw the characteristics of CB configuration of a transistor amplifier.
9. To draw the characteristics of CC configuration of a transistor amplifier.
10. To design a Zener regulator circuit and to find the regulation characteristics.
11. To draw the load line of a transistor amplifier under CE configuration.
12. To design and verify the self bias circuit operation.
13. To design and verify the voltage divider biasing circuit.
14. To verify the effect of emitter bypass capacitor.
15. To design a regulator circuit using Zener diode.

List of Equipments/Machine Required:

Circuit components, Breadboard, Hook-up wire, Power supply, CRO, Function generator

Recommended Books:

1. Laboratory Manual for Electronic Devices and Circuits, 4th Ed., David A. Bell, PHI

Chhattisgarh Swami Vivekanand Technical University, Bilai (C.G.)

Semester : B.E. III Sem. Branch : Mechanical , Mechatronics
Sub : Fluid Mechanics Lab Practical Code : 337323 (37)
Total Practical Periods : 20
Total Marks in End Semester Exam : 40

EXPERIMENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)

1. To determine the meta-centric height of a ship model.
2. To verify Bernoulli's Theorem.
3. To verify Impulse Momentum Principle.
4. To calibrate a Venturimeter and study the variation of coefficient of discharge.
5. To calibrate an orifice-meter.
6. Experimental determination of critical velocity in pipe.
7. To determine of head loss in various pipe fittings.
8. Flow measurement using Pitot tube.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
10. To determine the hydraulic coefficients (C_c , C_d and C_v) of an orifice.
11. To determine the coefficient of discharge of a mouth piece.
12. To obtain the surface profile and the total head distribution of a forced vortex.
13. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
14. To study the variation of friction factor for pipe flow.
15. To determine the roughness coefficient of an open channel.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Apparatus for determination of metacentric height
2. Bernoulli's apparatus
3. Impact of jet apparatus
4. Venturimeter
5. Orificemeter
6. Pipe friction apparatus
7. Orifice apparatus
8. Mouth Piece apparatus with the provision for determination of hydraulic coefficient C_c , C_d & C_v
9. Vortex flow apparatus
10. Apparatus of head loss in various pipe fittings.
11. Reynold's apparatus
12. Complete setup for flow measurement using Pitot tube
13. Complete set for open channel apparatus

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semster : B.E. III Sem.

**Branch : Information Technology,
Mechatronics**

Subject : Digital Electronics and Logic Design Lab

Code : 333323(33)

Total Practical Periods : 36

Total Marks in End Sem Examination : 40

Experiments To Be Performed : (Minimum 10 experiments)

- 1) To study the characteristics and operations of TTL Inverters , OR, AND,NOR and NAND gate using ICs.
- 2) To study NAND and NOR gates as a universal logic.
- 3) To study and prove Demorgan's Theorem .
- 4) To design Half and Full adder circuits using logic gates.
- 5) To design Half and full subtractor circuits using logic gates.
- 6) To study the binary parallel adder.
- 7) To design 4 bit magnitude comparator ckts.
- 8) To study the 7 segment decoder .
- 9) To design 4:16 decoder using two 3:8 decoder and four 2:4 decoder
- 10) To design 16: 1 Multiplexer using 4:1 Multiplexer.
- 11) To study various types of flip flops using logic gates and ICs.
- 12) To design Mod-N and divide by K counter.
- 13) To construct a 4 bit binary to gray converter and vice versa using IC 7486 .
- 14) To study Up-Down counter .
- 15) To study programmable shift registers.

List of Equipments /Machine Required:

- 1) Logic gate trainer
- 2) Digital ICs Trainer
- 3) Various ICs 7400,7402,7404,7408,7432,7486,74138,74151,74155 etc.

Recommended Books:

- 1) M. Mano : "Digital logic and computer design", PHI.
- 2) Floyd : "Digital fundamentals", UBS.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : **B.E. III Sem.**

Branch: **Electronics & Telecommunication,
Mechatronics**

Subject: **Programming with C Lab**

Code: **328323 (28)**

Total Practical Periods: **48**

Total Marks in End Semester Examination: **40**

List of programmes to be executed (but should not be less than 10):

1. Write a program to take the radius of a sphere as input and print the volume and surface and surface area of that sphere.
2. Write a program to take a 5-digit number as input and calculate the sum of its digits.
3. Write a program to take three sides of a triangle as input and verify whether the triangle is an isosceles, scalene or an equilateral triangle.
4. Write a program that will take 3 positive integers as input and verify whether or not they form a Pythagorean triplet or not.
5. Write a program to print all the Prime numbers between a given range.
6. Write a program to define a function that will take an integer as argument and return the sum of digits of that integer
7. Write a program to define a macro that can calculate the greater of two of its arguments. Use this macro to calculate the greatest of 4 integers.
8. Write a program to define a recursive function that will print the reverse of its integer argument.
9. Write a program to print the sum of first N even numbers using recursive function.
10. Write a program to sort an array using Bubble sort technique.
11. Write a program that will take the elements of two integer arrays of 5 element each, and insert the common elements of both the array into a third array (Set intersection)
12. Write a program to take 5 names as input and print the longest name.
13. Write a program to define a structure Student that will contain the roll number, name and total marks of a student. The program will ask the user to input the details of 5 students and print the details of all the students whose total marks is greater than a given value.
14. Write a program to define a union Contact that will contain the members Mobile no and E-mail id. Now define a structure Employee that will contain name, roll number, mode of contact (mob/e-mail) and a variable of type Contact as members. The program will ask the user to give the details of two Employees including mode of contact and the contact num/ E-mail. Print the details of both the Employees.
15. Write a program that will ask the user to input a file name and copy the contents of that file into another file.
16. Write a program that will take any number of integers from the command line as argument and print the sum of all those integers.

List of Equipments/Machine Required:

PCs, C-Compiler

Recommended Books:

Programming in ANSI C – E. Balaguruswamy

Tata Mc-Graw Hill

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : **B.E. III Sem.**

Subject : **Value Education**

No. of Periods : 2 pds/week

Total Marks in End Semester Exam. : NIL

Minimum number of class test to be conducted : Two

Branch : **Common to all Branches**

Code : **300325 (46)**

Tutorial Periods : NIL

Teacher's Assessment : **40 Marks**

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