CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Scheme of Teaching and Exam

Biomedical Engineering

Sem. III

S. No.	Board of Study	Subject Code	Subject	Periods per week L	T	P	Scheme of Exam Theory/ Pract. ESE	CT	TA	Total Marks	Credit L+(T+P)/2
1	Applied Mathematics	300311(14)	Mathematics – III	3	1	-	80	20	20	120	4
2	Electronics & Telecom.	328316 (28)	Programming with C	3	1	-	80	20	20	120	4
3	Biomedical	317313 (17)	Biochemistry	3	1	-	80	20	20	120	4
4	Electronics & Telecom.	317314 (28)	Network Analysis	3	1	-	80	20	20	120	4
5	Biomedical	317315 (17)	Anatomy and Physiology	4	1	-	80	20	20	120	5
6	Biomedical	317316 (17)	Biophysics	3	1	-	80	20	20	120	4
7	Electronics & Telecom.	317321 (28)	Programming with C, Lab	-	-	3	40	-	20	60	2
8	Biomedical	317322 (17)	Biochemistry Lab	-	-	3	40	-	20	60	2
9	Electronics & Telecom.	317323 (28)	Network Analysis Lab	-	-	3	40	-	20	60	2
10	Biomedical	317324 (17)	Anatomy and Physiology Lab	-	-	3	40	-	20	60	2
11	Humanities etc.	300325 (46)	Value Education	-	-	2	-	-	40	40	1
12			Library	-	-	1	-	-	-	-	-
		Total		**19**	**06**	**15**	**640**	**120**	**240**	**1000**	**34**

L-Lecture, T-Tutorial,
P-Practical, ESE- End sem. Exam, CT-Class Test,
TA- Teacher's Assessment,

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

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

Branch: **Civil, Mechanical, Mining, Chemical, Bio Medical**

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. III Sem.**
Branch: **Biomedical Engg., Electronics & Telecommunication**
Subject: **Programming with C**
Code: **328316 (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 – 1
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, readind 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 though 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.

Name of Text Books:

1. Let us C – Yashwant Kanetkar BPB Publication
2. Programming in ANSI C – E. Balaguruswamy Tata McGcraw Hill

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

Semester: **B.E. III Sem.** Branch: **Biomedical Engg.,**
Subject: **Biochemistry** Code**: 317313 (17)**
Total Theory Periods: **48** Total Tutorial Periods: **10**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Unit -1 **Chemistry of Bimolecules:** Chemistry of carbohydrates, Proteins and Lapids, and Amino acids.

Unit-2 **Prostaglandin** – Chemistry and functions, Immunoglobulins chemistry and functions, Chemistry of Enzymes, Chemistry of Nucleotides.

Unit-3 **Metabolism of Biomolecules:** Digestion and absorption of carbohydrates, Proteins and Lipids; Metabolism of carbohydrates; Proteins and Lipids, nutritional aspects of carbohydrates, Proteins and Lipids; Biological oxidation.

Unit-4 **Molecular Biochemistry:** Chemistry of Nucleic acids, Metabolism of Purines and pyrimidines, Hormones chemistry, mechanism of action and metabolic roles; heamcatabolism.

Unit-5 **Clinical Biochemistry:** Vitamin's and Minerals, Enzymes and Iso enzymes of clinical importance, Biotransformation of xenobiotics, Biochemistry of cancer, radioactive isotopes in biochemistry, Diet and Nutrition.

Text Books.

1. Textbook of Biochemistry Lenhinger
2. Biochemistry Stryer

Reference Books:

1. Harper Biochemistry
2. Textbook of Medical Biochemistry – Chatterjee & Shinde
3. Bio Chemistry – Dvore, J.G. voet
4. Physical biochemistry – Dferfilder.

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

Semester: **B.E. III Sem.** Branch: **Biomedical Engg.**
Subject: **Network Analysis** Code: **317314 (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 -1 **Network Topology & Review of loop and mode:** Graph of a network. Concept of tree an links. Incidence matrix. Tie set & cut set schedules, solution of network, and principles of duality & network transformation. Linearly independent KVL & KCL equation. Method of analysis of DC and AC networks. Network reduction using Y-A transformations. Coupled circuits. Locus Diagram.

Unit-2 **Networks theorems & Resonant circuits:** Reciprocity, Thevenin's, Norton's Maximum power transformation, Tellegen's and Miller's theorem. Series and parallel resonance, Frequency - response of series and parallel circuits, Q-factor, Bandwidth.

Unit-3 **Transient Behavior and initial conditions in networks**: Behavior of circuit element under switching condition and their representation. Evaluation of initial and final conditions in RL, RC & RLC circuits for AC & DC excitation

Unit-4 **Laplace transformation & Its application:** L.T. for fourier transformation Definition & Properties of Laplace Transformation. Inverse Laplace transform. Partial fraction expansion, initial & final value theorem. Shifting theorem. Convolution Integral. Step, Ramp and Impulse functions. Delayed functions. Laplace transform of Periodic and non-periodic signals.

Unit-5 **One & two port network parameters:** Driving point admittance & transfer function. Pole- zero concepts of the network function. Open circuit impedance parameters, Short circuit impedance parameters, Transmission parameters, H-parameters. Calculation of these parameters for two port networks.

Text Books.

1. Network Analysis, M.E . Van Valkenburg Pill.
2. Network Analysis and synthesis – Fraklin F.Kuo.

For Further Readings Ref:

3. Electric circuits: Joseph Edminister Schaum's series. Mc Graw Hill.
4. R.P. Punagin : Electrical circuit theory and Analysis.

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

Semester: **B.E. III Sem.** Branch: **Biomedical Engg.**
Subject: **Anatomy & Physiology** Code: **317315 (17)**
Total Theory Periods: **48** Total Tutorial Periods: **10**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Unit – 1 Introduction to the Anatomical terms in relation to the parts of the body, various systems and organs.
Elementary knowledge of the human skeleton.

Unit – 2 **Cellular Physiology**: Sub cellular organization and functional morphology, cell metabolism, Transport across cell membranes and membrane potentials. Cell division and cell cycle.

Tissues of the Body: Properties and functions of Epithelial, Connective, Muscular and nervous tissue.

Unit – 3 **Blood and cardiovascular system:** Compositions and functions of blood; Plasma proteins, Red blood cells, genesis and fate, Anemia, White Blood Cells, type and physiological role, coagulation of Blood, role of various factors involved, anticoagulants, Blood grouping and blood related disorders.

Structure of Heart and circulation, cardiac cycle, impulse generation and transmission, Electrocardiogram, blood pressure, its measurement, regulation and maintenance of blood pressure, hypertension.

Unit – 4 **Digestive system:** Gross anatomy of alimentary canal, digestion and absorption of carbohydrates, Proteins and Fats, Gastrointestinal hormones, Role of pancreas and liver.

Respiratory System: Organs involved in respiration, Mechanics of respiration, Chemistry of respiration (gaseous exchange and transport in blood), Bhor effect, nervous control of respiration, role of chemo receptors, Hearring_ breuer reflex, respiratory volume and vital capacity.

Renal System: Structure of Kidney and Urinary tracts, Nephrons, Physiology of urine formation, Micturition, Diuresis.

Unit –5 **Nervous system. :-** Neuron, Synapse and neuro - effector junction, Nerve impulse generation and transmission, reflex arc general organization of central and peripheral nervous system, central nervous system (Parts and Function), automatic nervous system. Body Temperature regulation, role of physical and chemical factors, fever and antipyretic drugs.
Endocrine System: Physiology of Endocrine glands and related disorders.
Physiology of Special senses (ear, eye smell, taste and pain) structure and function of skin.

Test Books

1. A.C. guyton, Text Bollk of Medical Physiology.
2. William F. ganong: Review of Medical Physiology, Prentice Hall International inc.

Other Suggested Reference Books

3. Gerard J. Tortora and Nicholas, P. Anangnostakos: Principle of anatomy and Physiology, harper and Row, New York.
4 Keele and Neil: Samson Wright applied physiology.
5. A.J. Vander, J.hH. Sherman and D.C. Lucian: Human Physiology.

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

Semester: **B.E. III Sem.** Branch: **Biomedical Engg.**
Subject: **Biophysics** Code: **317316 (17)**
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 –1 Introduction to biophysics: Biophysical system, its component and mathematical analysis. Mechanical biophysical systems; Elasticity of living cell materials; breaking strength of bones; muscles as a helical spring; viscosity of elemental protoplasm and its determination in cells; surface tension of bio-fluids and its measurement.

Unit – 2 Techniques: CD/ORD. Fluorescence spectroscopy, Raman Spectroscopy, Electron Microscopy; Radiation biophysics; The generation andsources of Electromagnetic radiations (X-rays; UV; IR; and MW) and effect of UV and X-rays on nucleic acids.

Theory and applications of colorimeter, spectrophotometer, pH meter & buffers.

Unit –3 Fluid Biophysical system: Fluid flow across the membrane; Fick's diffusion equation. Influence of tube wall; radius of tube; tube length and RBC concentration on blood flow; total energy equation for blood; the heart as a pump.

Unit –4 Association of macromolecules. Lipids in the biological membranes. Protein in the biological membranes. Biophysical micelle stability; Bilayer lipid membrane equilibrium- Donnan effect; pH across membrane and membrane potential.

Recent trends in Biophysics: Elementary; ideas of (i) Bio Cybernetics (ii) cancer biophysics (iii) Space biophysics.

Unit –4 Recent trends in Biophysics: Elementary ideas of (i) Bio cybernetics (ii) cancer biophysics (iii) Space biophysics.

Unit –5 **Recent trends in Biophysics:** Elementary ideas of (i) Bio cybernetics (ii) cancer biophysics (iii) Space biophysics.

Text Books

1. Biochemistry by L. Stryer (1999) WH Freeman and co.
2. Biophysics by R.N. Roy Publishers: - New central book Agency Pvt. ltd.

Other Suggested Reference books: -

1. Stacy, R.W. & D.T. Williams Essentials of Biological and Medical Physics. Mc Graw – Hill,
3. Ackeerman Eugene: Biophysical science; Prentice hall.
4. Casey, E.J. Biophysics; concept of mechanism, A. East- West Press.
5. Pollord, Molecular biophysics, Academic press.
6. Volkenstein, M.V. Biophysics; Mir Publications.
7. Stanford, C., An introduction to Biophysics, Academic press.
8. Biophyscial chemistry Part I & III by Cantor and Schimmel (1980) WH Freeman & Company.

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

Semester : **B.E. III** Branch: **Biomedical Engg.**
Subject: **Programming with C Lab** Code: **317321 (28)**
Total Practical Periods: **40**
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-Gcraw Hill

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

Semester : **B.E. III** Branch: **Biomedical Engg.**
Subject: **Bio Chemistry Lab** Code: **317322 (17)**
Total Practical Periods: **40**
Total Marks in End Semester Examination: 4**0**
Minimum number of class test to conducted: Two

Experiment list

1) **Qualitative test for carbohydrates**

1. Molisch Test
2. Fehling Test
3. Benedict Test
4. Barfords test
5. Bials test
6. Methylamine test
7. Iodine test (for polysaccharides ->starch)
8. Anthrone test

2) **Qualitative test for Proteins**

1. Xanthoproteic test
2. Biuret test
3. Ninhydrin test

3) **Quantitative estimation of** serum protein by biuret test

4) **Quantitative estimation of** protein by follin lowry test

5) **Quantitative estimation of** carbohydrates by benedict regent.

List of Equipments:

Colorimeter
Spectrophotometer

Reagents:

Molisch Reagnt
Fehling Solution
Benedict Solution
Biuret Solution
Iodine Solution
Starch
Ninhydrin Solution
Follin Lowry Solution
Glucose
Anthrone

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

Semester **: B.E. 3rd** Branch **: Biomedical Engineering**
Subject : **Network Analysis lab** Code **: 317323(28)**
Total Practical Periods: **40**
Total Marks in End Semester Examination**: 40**

Experiments to be performed: (minimum 10 experiments)

1. To calculate & verify the Q factor of a given RL series circuit
2. To calculate & verify the Q factor of a given RC series circuit.
3. To calculate & verify the fo factor of a given RLC series/parallel circuit.
4. To calculate & verify the fo, Q factor of a given RLC parallel circuit.
5. For a given equivalent circuit by applying source transformation theory find Vo (Thevenin's equivalent circuit)
6. For a given equivalent circuit by applying source by transformation theory find i o (Norton's equivalent circuit)
7. For a given equivalent circuit select a appropriate dual network (duality property)
8. To calculate & verify the value of *do for a given equivalent circuit by superposition theorem.
9. To analyze the pulse response of a series RL circuit
10. To analyze the pulse response of a series RC circuit.
11. To analyze the impulse response of a series RC circuit (Low pass filter).
12. To analyze the impulse response of a series CR circuit (High pass filter).
13. To analyze the impulse response of a band pass filter.
14. To calculate the value of impedance by applying Millman theorem and satisfy the condition of duality for Millman theorem.
15. For a given Two-port network calculate Z&Y parameter.
16. For a given Two-port network calculate ABCD (Transmission)
17. For given Two-port network calculate h (hybrid) parameter & g (inverse hybrid) parameter,
18. For a given Two-port network by applying source transformation design
    i. T to P network
    ii. P to T network.

List of Equipments/Machine Required :

Breadboard, Circuit components like resistor, capacitors, inductors etc. , Power supply, Function Generator, Ammeter, CRO.

Recommended Books :

1. **Network Theory : Analysis & Synthesis -Smarjit Ghosh , PHI**

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

Semester : **B.E. III**
Branch: **Biomedical Engg.**
Subject: **Anatomy & Physiology Lab**
Code: **317324 (17)**
Total Practical Periods: **40**
Total Marks in End Semester Examination: 4**0**

Experiments to be performed:

1. Determination of Bleeding time,
2. Determination of Clotting time,
3. Measurement of Blood Pressure
4. R.B.C. Counting
5. Total W.B.C. Counting
6. Detection of Blood group
7. Preparation of blood film & staining
8. Detection of Hemoglobin
9. Study of Bones

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

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 ¼lek/kku½] prosperity ¼lef)½] trust in self and others ¼vHk;½] and coexistence ¼lgvfLrRo½ 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 gaurantee 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 ¼O;oLFkk½ and co-existence ¼lgvfLrRo½ 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 ¼O;oLFkk½ and COEXISTENCE ¼lgvfLrRo½ 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 ¼tM½ and consciousness ¼pru;½ aspects of Nature, Four distinct synergetic orders in Nature
- Padaarth Awastha ¼inkFk voLFkk½] Pran Awastha ¼ik.k voLFkk½] Jiv Awastha ¼tho voLFkk½] and Gyan Awastha ¼Kku voLFkk½] 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 ¼tkxfr½] 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 ¼vfoHkkT; lekt½ and Universal Organised System ¼lkoHkkSe O;oLFkk½
- Transition from synergetic disorder ¼vO;oLFkk½ to synergetic order ¼O;oLFkk½
- Evaluation of Understanding, work and behaviour.

REFERENCES

1. Jeevan Vidya Camp ¼f'kfoj½ notes
2. An Introduction to Jeevan Vidya by Shri A. Nagaraj