Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Diploma / Degree / Honors)*			**Semester - III**	**Session: 2025-2026**
1	**Course Code**	**BCSC- 03 T**		
2	**Course Title**	Enzymology		
3	**Course Type**	Discipline Specific Course (Theory)		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Describe the enzyme catalysis and regulatory enzymes. ➢ Explain the mechanism of action of enzymes and role of vitamins as coenzyme precursors. ➢ Express the Michaelis-Menten equation, and double reciprocal plots, and graphical representation of various inhibitors. ➢ Describe the principles and methods of Diagnosis by enzymes.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	**Topics (Course contents)**	**No. of Period**
I	**Introduction to enzymes:** Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. Coenzymes. **Features of enzyme catalysis** Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis	09
II	**Enzyme kinetics:** Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant - Mono substrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot, Km and Vmax, K_{cat} and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme.	12
III	**Enzyme inhibition:** Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors. **Mechanism of action of enzymes -** General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme).	12
IV	**Regulation of enzyme activity:** Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition **(**aspartate transcarbomoylase), reversible covalent modification phosphorylation (glycogen phosphorylase). Proteolytic cleavage- zymogen. Multienzymecomplex as regulatory enzymes, pyruvate dehydrogenase. Isoenzymes - properties and physiological significance (lactate dehydrogenase). **Application of enzymes in diagnostics:** (SGPT, SGOT, creatine kinase, alkaline and acidphosphatases), Enzyme electrodes, biosensors.	12
Keywords	Coenzyme, Ribozyme, Cofactor, Apoenzyme, Michaelis-Menten equation.	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt.Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., OxfordUniversity Press Inc. (New York), ISBN:0 19 850229 X.

Online Resources–

e-Resources / e-books and e-learning portals

- https://www.jbc.org/Enzymology
- https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology
- https://www.biologyonline.com/dictionary/coenzyme
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/
- https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster
- https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 Marks
Continuous Internal Assessment (CIA): 30 Marks
End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 +20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10=40 Marks**	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science ***(Diploma / Degree/ Honors)***			**Semester -III**	**Session: 2025-2026**
1	**Course Code**	**BCSC- 03 P**		
2	**Course Title**	Enzymology		
3	**Course Type**	Discipline Specific Elective (Practical)		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	On successful completion of the course, the student shall be able to: ➢ Explain purification of proteins by various methods. ➢ Estimate enzyme activity by different methods. ➢ Explain progress curve of enzyme. ➢ Practice the effect of physical parameters on enzyme activity.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**		**Min Passing Marks: 20**

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	➢ Partial purification of acid/ alkaline phosphatase. ➢ Assay of enzyme activity and specific activity, e.g. acid/ alkaline phosphatase. ➢ Effect of pH on enzyme activity and determination of optimum pH. ➢ Determination of Km and Vmax using Lineweaver-Burk graph. ➢ Isolation and purification of urease. ➢ Inhibition of alkaline/acid phosphatase activity by EDTA ➢ Effect of substrate concentration on alkaline phosphatase activityand determine of its Km value. ➢ Effect of temperature of enzyme activity and determination of activation energy. ➢ Effect of enzyme concentration on enzyme activity.	**30**
Keywords	Assay, Enzyme, Specific activity, Temperature,	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

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- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://en.wikibooks.org/wiki/Biochemistry
- https://www.pdfdrive.com/biomolecules-books.html
- https://ncert.nic.in/textbook.php

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science ***(Diploma / Degree / Honors)***			**Semester - III**	**Session: 2025-2026**
1	**Course Code**	**BCSE- 01 T**		
2	**Course Title**	Clinical Biochemistry		
3	**Course Type**	Discipline Specific Elective (Theory)		
4	**Pre-requisite (if, any)**	As per the Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Learn about the normal constituents of urine, blood and their significance in maintaining good health. ➢ Understand the mechanisms of causation of diseases of liver, kidney and of Cancer. ➢ Describe with the variations in the levels of trigycerides and lipoproteins and their relationship with various diseases. ➢ Explain with the role of enzymes in diagnosis of various diseases.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	**Topics (Course contents)**	**No. of Period**
I	**Urine:** Normal composition of urine – volume, pH, colour, specific gravity. Constituents-urea, uric acid, creatinine, pigment. Abnormal constituents – glucose, albumin, ketone bodies, vriations in urea, creatinine, pigments and their clinical significance in brief. Abnormalities in Nitrogen Metabolism – Uremia, hyperuricemia, porphyria and factors affecting nitrogen balance.	09
II	**Blood:** Normal constituents of blood and their variation in pathological conditions - urea, uric acid, creatinine, glucose, bilirubin, total protein, albumin/globulin ratio. Lipid profile cholesterol, triglycerides, lipoproteins - HDL and LDL. **Blood Clotting –** Disturbances in blood clotting mechanisms – haemorrhagic disorders –haemophilia, von Willebrand's disease, purpura, Rendu-Osler-Werber disease, thrombotic thrombocytopenic purpura, disseminated intravascular coagulation, acquired prothrombin complex disorders, circulating anticoagulants.	12
III	**Diagnostic Enzymes** – Enzymes in health and diseases. Biochemical diagnosis of diseases by enzyme assays – SGOT, SGPT, alkaline phosphatase, CPK, cholinesterase, LDH Disorders of liver and kidney – Jaundice, fatty liver, normal and abnormal functions of liver and kidney. Inulin and urea clearance. **Electrolytes and acid-base balance** – Regulation of electrolyte content of body fluids and maintenance of pH, reabsorption of electrolytes.	12
IV	**Biochemistry of Cancer**, Cellular differentiation in cancer, carcinogens and cancer therapy **Inborn errors of metabolism:** Sickle cell anaemia, phenyl ketonuria, Neimann – Pick disease and Gaucher's disease.	12
Keywords	Blood, Urine, Cancer, Enzymes, Diseases	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Concise Medical Physiology – Choudhary – New Central Book Agency – Calcutta.
- TextBook of Medical Physiology – Guyton – Prism Books Pvt. Ltd. – Bangalore.
- Harper's Biochemistry – Murray, Granner, Mayes, and Rodwell – Prentice Hall International Inc.
- Textbook of medical physiology: A. C. Gyton, and J. E HallSaunders Elsevier Publications, A division of Reed Elsevier India Pvt .Ltd.New Delhi ISBN 81-8147-084-2
- T.M. Delvin (editor), Text book of biochemistry with clinical correlation, (1982), John Wiley & Sons Inc. USA.

Online Resources–

e-Resources / e-books and e-learning portals

- https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology
- https://www.jbc.org/Enzymology
- https://www.biologyonline.com/dictionary/coenzyme
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/
- https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster
- https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20** **+20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1**= **10** Mark; **Q2**. Short answer type- **5x4** =**20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10**=**40 Marks**	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A:	**Introduction**			
Program: Bachelor in Science *(Diploma / Degree / Honors)*			**Semester - III**	**Session: 2025-2026**
1	**Course Code**	**BCSE-01 P**		
2	**Course Title**	Clinical Biochemistry		
3	**Course Type**	Discipline Specific Elective (Practical)		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	On successful completion of the course, the student shall be able to: ➢ Understand Qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	➢ Qualitative and quantitative analysis of urine : proteins, Bence-Jones proteins, Cl-, Ca+2 ➢ Qualitative analysis of abnormal constituents in urine - glucose, albumin, bile pigments, bile salts and ketone bodies. ➢ Separation of Blood Plasma and Serum ➢ Determination of A/G ratio in serum ➢ Isolation and estimation of serum cholesterol ➢ Serum enzyme assays: alkaline phosphatase, SGOT, SGPT ➢ Estimation of bilirubin (conjugated and unconjugated) in serum. ➢ Estimation of total lipids in serum by vanillin method. ➢ Estimation of cholesterol in serum. ➢ Estimation of blood urea nitrogen from plasma. ➢ Estimation of SGPT and SGOT in serum. ➢ Preparation of starch from potato and its hydrolysis by salivary amylase. a. Determination of achromatic point in salivary amylase. b. Effect of sodium chloride on amylases	**30**
Keywords	Blood, Plasma, Liver function test, Serum enzymes	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

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- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

Online Resources–

- **e-Resources / e-books and e-learning portals**
  https://www.thermofisher.com/in/en/home/references/protocols/cell-and-tissue-analysis/elisa-protocol/elisa-sample-preparation-protocols/plasma-and-serum-preparation.html
- https://labmonk.com/determination-of-sgot-and-sgpt
- https://www.labcorp.com/help/patient-test-info/total-protein-and-albuminglobulin-ag-ratio
- https://link.springer.com/article/10.1007/s101570200005
- https://jcp.bmj.com/content/jclinpath/6/3/173.full.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science ***(Diploma / Degree / Honors)***			**Semester - IV**	**Session: 2025-2026**
1	**Course Code**	**BCSC-04 T**		
2	**Course Title**	Intermediary Metabolism		
3	**Course Type**	Discipline Specific Theory		
4	**Pre-requisite (if, any)**	As Per the Course		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Acquire the knowledge of energy production in living systems by the degradation of fatty acids. ➢ Explain the various pathways of fatty acid synthesis in living systems. ➢ Explain the mechanism of the machinery system involved in carbohydrate metabolism. ➢ Describe breakdown and synthesis of Amino acids and nucleotides in humans and recognize its relevance with respect to nutrition and human diseases.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	**Topics (Course contents)**	**No. of Period**
I	**Carbohydrate Metabolism :** Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Reactions and energetic of TCA Cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reaction and Physiological significance of pentose phosphate pathway. Regulation of Glycolysis and TCA cycle.	12
II	**Electron Transport Chain and Oxidative Phosphorylation :** Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain. Hypothesis of mitochondrial Oxidative phosphorylation. Transport of reducing potentials into mitochondria.	09
III	**Lipid Metabolism :** Introduction, hydrolysis of triacylglycerols, transport of fatty acids into Mitochondria, β oxidation saturated fatty acids, ATP yield from fatty acid Oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of Ketone bodies, oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids.	12
IV	**Amino acid Metabolism:** General reactions of amino acid metabolism: transamination, oxidative Deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of Amino acids. Glycogenic and ketogenic amino acids. **Nucleotide Metabolism:** Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and Degradation of purines and pyrimidines .	12
Keywords	Glycolysis, Oxidative Phosphorylation, Oxidation, Urea cycle, Nucleotides, Porphyrins.	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

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- Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley& Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

Online Resources–

e-Resources / e-books and e-learning portals

- https://www.britannica.com/science/metabolism
- https://www.sciencedirect.com/science/article/pii/S0009912013001677
- https://pubmed.ncbi.nlm.nih.gov/23720291/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

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End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1**= **10** Mark; **Q2**. Short answer type- **5x4** =**20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10**=**40 Marks**	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science ***(Diploma / Degree/ Honors)***			**Semester - IV**	**Session: 2025-2026**
1	**Course Code**	**BCSC- 04 P**		
2	**Course Title**	Intermediary Metabolism		
3	**Course Type**	Discipline Specific Course (Practical)		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Describe the importance of lipids as storage molecules and as structural component of biomembranes. ➢ Explain the importance of high energy compounds , synthesis of ATP under aerobic and anaerobic conditions. ➢ Explain the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance. ➢ Explain perturbations in the carbon metabolism can lead to various disorders such as diabetes and cancer.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	**Topics (Course contents)**	**No. of Period**
Lab./Field Training/ Experiment Contents of Course	➢ To understand the concepts of preparation of buffers. ➢ To estimate biomolecules such as glucose, proteins, cholesterol in clinical samples. ➢ To isolate of lipids from egg. ➢ Estimation of salivary amylase ➢ Separation of Blood Plasma and Serum ➢ Estimation of proteins from serum by biuret and Lowry methods. ➢ Estimation of bilirubin (conjugated and unconjugated) in serum. ➢ Estimation of cholesterol in serum. ➢ Estimation of blood urea nitrogen from plasma. ➢ Preparation of starch from potato and its hydrolysis by salivary amylase. ➢ Determination of achromatic point in salivary amylase. ➢ Effect of sodium chloride on amylases.	**30**
Keywords	Serum, Plasma, lipids, enzymes estimation, quantitative	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
- Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley& Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://link.springer.com/article/10.1007/s00217-008-0998-4
- https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/l13_c_met_lipids.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Diploma / Degree/Honors)*			**Semester - IV**	**Session: 2025-2026**
1	**Course Code**	**BCSE-02 T**		
2	**Course Title**	Biology of Infectious Diseases		
3	**Course Type**	Discipline Specific Elective (Theory)		
4	**Pre-requisite (if, any)**	As Per Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Understand various classes of microbial infectious agents, their mode of action, biology of the diseases, transmission of diseases, the concepts of treatment, and drug resistance for various antimicrobial agents. ➢ Demonstrate molecular basis of diagnosis and treatment of diseases as well as strategies for development of vaccines against these diseases. ➢ Explain the details of important infectious diseases such as tuberculosis, AIDS, malaria, filariasis, etc. ➢ Understand the significance of hygiene, sanitation, vaccination in prevention of infectious diseases.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**		**Min Passing Marks: 40**

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	**Topics (Course contents)**	**No. of Period**
I	**Infectious diseases:** Classification, Nosocomial infections; Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens. Safety measures when working with pathogens, biosafety levels, infection and evasion. **Fungal diseases:** Etiology, characteristics and diagnosis of Candidiasis, Sporotrichosis, Aspergillosis and Ring worm.	09
II	**Bacterial diseases:** classification of bacterial pathogens, virulence factors and host pathogen interaction. Bacterial toxins, enterotoxins and their mode of action, diarrhea, cholera; Tuberculosis, infection and pathogenicity, diagnostics, therapeutics and vaccines, drug resistance. Other bacterial diseases such as - Typhoid, Tetanus, Anthrax and Pneumonia; their virulence factors and host pathogen interactions.	14
III	**Viral diseases:** Structure and classification of viruses, viral virulence factors, host pathogen interactions; AIDS: history, causative agent, pathogenesis, diagnostics, drugs; Other viral diseases such as Hepatitis, Influenza, Rabies, Dengue and Polio; Chicken Pox, Herpes Virus.	12
IV	**Parasitic diseases:** Classes of parasites and diseases caused by them, Malaria: causative agents, vectors, etiology, diagnostics, drugs, vaccine development. Role of drugs, vaccines and sanitation in prevention and treatment of infectious diseases.	10
Keywords	Infection, Disease, Prevention, Precaution	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

PART–C: Learning Resources
Text Books, Reference Books and Others
Text Books Recommended – ➢ Jawetz, Melnick and Adelbergs Medical Microbiology 27th ed., McGraw Hill Education ➢ Klien's Microbiology (2008) 7th ed., Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ➢ Sherris Medical Microbiology: An introduction to infectious diseases (2010) 4. Kenneth J. Ryan, C.,George Ray, Publisher: McGraw-Hill.E-learning Resources
Online Resources– **e-Resources / e-books and e-learning portals** ➢ https://www.britannica.com/science/metabolism ➢ https://www.sciencedirect.com/science/article/pii/S0009912013001677 ➢ https://pubmed.ncbi.nlm.nih.gov/23720291/ ➢ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/

PART -D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: **Maximum Marks: 100 Marks** **Continuous Internal Assessment (CIA): 30 Marks** **End Semester Exam (ESE): 70 Marks**		
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 +20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1**= **10** Mark; **Q2**. Short answer type- **5x4** =**20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10**=**40 Marks**	

Govt. Nagarjuna PG College of Science Raipur (Chhattisgarh)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science ***(Diploma / Degree/ Honors)***			**Semester - IV**	**Session: 2025-2026**
1	**Course Code**	**BCSE- 02 P**		
2	**Course Title**	Biology of Infectious Diseases		
3	**Course Type**	Discipline Specific Elective- Practical		
4	**Pre-requisite (if, any)**	As Per the Program		
5	**Course Learning. Outcomes (CLO)**	➢ Students will acquire the knowledge to isolate bacteria from water/sewage samples, to stain bacteria, fungi, acid fast bacilli and to perform important diagnostic tests for infectious diseases such as WIDAL test. ➢ Students will be exposed to permanent slides of pathogens in order to get hands-on training to know nature of various pathogens causing diseases.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	**Topics (Course contents)**	**No. of Period**
Lab./Field Training/ Experiment Contents of Course	➢ Grams staining for bacteria ➢ Isolation and culture of bacteria from water/sewage samples. ➢ Demonstration of various media for bacterial culture ➢ Isolation and enumeration of bacteriophages (PFU) from water/sewage samples ➢ WIDAL test ➢ Acid fast staining ➢ Permanent slides of pathogens: Mycobacterium tuberculosis, Leishmania, Plasmodium falciparum ➢ Fungal staining	**30**
Keywords	Diagnostic tests, Infection identification, Methods	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Klien's Microbiology (2008) 7th ed., Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York)
- Jawetz, Melnick&Adelbergs Medical Microbiology 27th ed., McGraw Hill Education

Online Resources–

e-Resources / e-books and e-learning portals

- https://link.springer.com/article/10.1007/s00217-008-0998-4
- https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/l13_c_met.pdf

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **Performed the Task based on lab. work - 20 Marks** **Spotting based on tools & technology (written) – 10 Marks** **Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**