

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester -V	Session: 2024-2025
1	Course Code	CHSC-05T	
2	Course Title	ORGANIC AND INORGANIC CHEMISTRY - I	
3	Course Type	DSC	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ Explore role of nitrogen in organic chemistry by studying N-containing compounds and heterocycles. ➤ Unravel molecular structures using techniques like rotational, vibrational, and Raman spectroscopy. ➤ Demystify bonding in transition metal complexes, including stability, lability, and magnetic properties. ➤ Understand the importance of organometallic and inorganic compounds in biological systems. 	
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 Periods
I	(A) Organic Compound of Nitrogen Preparation of Nitroalkanes and Nitroarenes, Chemical properties of nitroalkanes, Mechanism of nucleophilic substitutions in nitroarenes, Reduction of nitroalkane in acidic, neutral, and alkaline medium. Picric acid Amines:- Nomenclature, Structure and stereochemistry. Basicity, Structural feature effecting basicity of amines. separation of primary, secondary and tertiary amines. Amine salt as phase transfer catalyst. Preparation of alkyl and aryl amines:- reduction of nitro compound, reductive amination of aldehydic and ketonic compounds. Gabriel Phthalimide reaction, Hoffmann Bromamide reaction. Physical and chemical properties of amine: electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid, synthetic transformation of aryl diazonium salts, Azo-coupling reaction.		12
II	Spectroscopy: General introduction, electromagnetic radiation, region of spectrum, representation of spectral width and intensity of spectral transition. (A) Rotational spectra of diatomic molecule as rigid rotor, selection rule, energy level, transition, spectra. Determination of bond length, Isotope effect, Qualitative description of non-rigid rotor. (B) Vibrational Spectra: Fundamental vibrational bands and their symmetry. Diatomic molecule as harmonic oscillator. Selection rule, pure vibrational spectrum, Determination of force constant Anharmonic oscillator. (C) Raman Spectra: introduction, concept of polarization, quantum theory, stoke and antistoke line, pure rotational and vibrational Raman spectra. Applications of Raman spectra.		11
III	(A) Metal Ligand Bonding in Transition Metal Complex: postulate of CFT. Splitting of d orbitals in octahedral, tetrahedral complex, Spectro-chemical series, Calculation of CFSE, Factors affecting CFSE, Applications of CFSE, Jahn-Teller Distortion, Limitations of CFT. (B) Thermodynamic and Kinetic aspects of Metal Complexes: A brief introduction of		11

	thermodynamic and kinetic stability of complex, Stepwise and overall stability constant. (C) Magnetic properties: Types of magnetic behavior, Methods of determining magnetic susceptibility, Spin Only formula, L-S Coupling, Calculation of effective magnetic moment, Orbital contribution to magnetic moment.	
IV	(A) Organometallic Chemistry: Definition, nomenclature, and Classification of organometallic compounds. Preparation, properties, bonding and application of alkyls and aryls of Li, Al. A brief account of metal ethylenic metal complexes special reference to Zeise's salt. Mononuclear carbonyls and nature of bonding in metal carbonyls. 18 electron rules (Effective Atomic Number Rule). Ziegler-Nata Catalyst for polymerization of alkene, Wilkinson Catalyst and Hydrogenation, Hydroformylation. (B) Bioinorganic Chemistry: Essentials and trace elements in biological system, metalloporphyrins, with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to Na ⁺ K ⁺ Ca ²⁺ and Mg ⁺² , Nitrogen fixation.	11
Keywords	Amines, Nitro compounds, Zeigler-Nata Catalyst, Wilkinson Catalyst, rigid rotor, harmonic oscillator, Hemoglobin, myoglobin.	

Signature of Convener & Members:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Bahl, A., & Bahl, B. S. (2020). *Organic chemistry (5th ed.)*. S. Chand & Company.
2. Madan, R. D. (2018). *Advanced organic chemistry*. S. Chand & Company.
3. Soni, P. L. (2019). *A textbook of organic chemistry*. S. Chand & Company.
4. Sharma, B. K. (2015). *Spectroscopy*. GOEL Publishing House.
5. Kaur, H. (2018). *Spectroscopy*. Pragati Prakashan.
6. Das, A. K. (2012). *Bioinorganic Chemistry*. Publisher.

Reference Books Recommended:

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). *Principles of Instrumental Analysis*. Cengage Learning.
2. Mehrotra, R. C. (2010). *Organometallic Chemistry*. New Age International.
3. Carbtree, R. H. (2014). *Organometallic Chemistry of the Transition Metal*. University Science Books.
4. Housecroft, C. E., & Sharpe, A. G. (2012). *Inorganic Chemistry*. Pearson.
5. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2010). *Inorganic Chemistry*. Pearson.

Online Resource:

- > e-Resources / e-books and e-learning portals
- > https://onlinecourses.nptel.ac.in/noc23_cy01/preview
- > <https://pubs.rsc.org/en/content/articlelanding/1978/f2/f29787401203>
- > https://onlinecourses.swayam2.ac.in/cec23_cy03/preview
- > https://onlinecourses.nptel.ac.in/noc22_cy12/preview

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

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM**

PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester -V	Session: 2024-2025
1	CourseCode	CHSC-05P	
2	CourseTitle	CHEMISTRY LAB COURSE -V	
3	CourseType	DSC	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To apply the knowledge of qualitative and quantitative estimations in real sample analysis. ➤ To get 'Hands on Training' and develop skill for synthesis of various inorganic compounds. ➤ To learn the concept of gravimetric estimation. ➤ To learn use of conductometer and spectrophotometer for titration. 	
6	CreditValue	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			
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Coursecontents)		No.ofPeriod
Lab./Field Training/ Experiment Contents of Course	1)To verify Beer-Lambert Law for $KMnO_4/ K_2Cr_2O_7$ and determine the concentration of the given solution of the substrate from absorbance measurement. 2)To Determine the strength of the given acid conductometrically using standard alkali solution. 3)Gravimetric estimation of Ba as $BaSO_4$ from given solution of $BaCl_2$. 4)Inorganic compound synthesis: (i) Synthesis of sodium trioxalato ferrate(III) $Na_2[Fe(C_2O_4)_3]$ and determination of its composition by permanganometry. (ii) Synthesis of Ni-dimethylglyoxime complex $[Ni(dmg)_2]$ (iii) Synthesis of Tetraamminecopper(II) sulphate $[Cu(NH_3)_4]SO_4$ (iv) Synthesis of Cis- and Trans-bisoxalatochromate(III)ion.		30
Keywords	<i>Spectrophotometer, Lambert beers law, Gravimetric estimation, synthesis of inorganic complexes</i>		

Signature of Convener & Members (CBoS):

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books:

1. Chatwal, G. R., & Sharma, A. (n.d.). *Instrumental methods of chemical analysis*. Himalaya Publishing House.
2. Raj, G. (2009). *Advanced Practical Inorganic Chemistry*. Krishna Prakashan.

Reference Books:

1. Svehla, G. (Ed.). (1978). *A textbook of quantitative inorganic analysis* (by A. I. Vogel). ELBS Publishers and Distributors. (Original work published 1968)
2. Henderson, W. A. (n.d.). *Inorganic synthesis*. Benjamin-Cummings Publishing Company.
3. Fernelius, W. G. (2009). *Experimental inorganic chemistry* (Adapted by R. K. Sharma & G. Panda). New Age International Publishers. (Original work published 1972)
4. Mendham, J., Denney, R. C., Barnes, J. D., & Thomas, M. (Eds.). (2000). *Vogel's textbook of quantitative chemical analysis* (6th ed.). Pearson Education India. (Original work by A. I. Vogel)
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (Eds.). (1989). *Vogel's textbook of practical organic chemistry* (5th ed.). Longman Scientific & Technical. (Original work by A. I. Vogel)

Online Resources:

- e-Resources / e-books and e-learning portals
- <https://www.youtube.com/watch?v=s7pXbV9dumI>
- <https://onlinelibrary.wiley.com/series/2146>
- [https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_11_Experiments/07%3A_Gravimetric_Analysis_\(Experiment\)](https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_11_Experiments/07%3A_Gravimetric_Analysis_(Experiment))
- <https://mas-iiith.vlabs.ac.in/exp/beer-lambert-law/>

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:






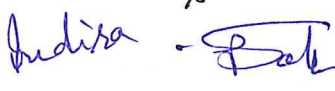

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

End Semester Exam(ESE):35Marks

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

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester- V	Session: 2024-2025
1	CourseCode	CHSE-03T	
2	CourseTitle	DYES & POLYMER CHEMISTRY	
3	CourseType	DSE	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To know about various synthetic dyes and their structures. ➤ To understand classification, colour and chemical constitution of dyes. ➤ To know about various types of polymeric materials. ➤ To understand preparation, structure, properties and application of polymers. 	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	TotalMarks	Max.Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
TotalNo.of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics(Course contents)		No.ofP eriod
I	<p>Introduction to dyes: Requirements of a good dye Solubility, Linearity, Co-planarity, Fastness, Substantivity, Economic viability. Definition of fastness and its properties and Mordants with examples Explanation of nomenclature or abbreviations of commercial dyes with at least one example suffixes – G, O, R. Naming of dyes by colour index (two examples) used in dye industries.</p> <p>Colour and chemical constitution of dyes: Absorption of visible light, colour of wavelength absorbed and complementary colour, chromogen, chromophore, auxochrome bathochromic and hypsochromic shifts. Relation of colour to resonance in the following classes of dyes: Azo, Triphenylmethane, Anthraquinone.</p>		12
II	<p>Classification of dyes based on application: Definition, fastness properties and applicability on substrates, examples with structures. (a) Acid dyes – Orange II, Alizarin Cyanine Green G. (b) Basic dyes – Crystal Violet, Bismark Brown. (c) Direct Cotton Dyes – Chrysophenine G. (d) Azoic dyes – Diazo components: Fast Red B Base, Fast Blue B Base; Coupling components: Naphthol AS, Naphthol AS-G. (e) Mordant dyes – Eriochrome Black T, Alizarin. (f) Vat dyes – Indigo, Indanthrene (g) Disperse dyes– Celliton Scarlet B, Disperse Yellow 6G</p>		11
III	<p>Introduction and history of polymeric materials: Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.</p> <p>Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.</p>		11
IV	<p>Determination of molecular weight of polymers (M_n, M_w, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index</p> <p>Brief introduction to preparation, structure, properties and application: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride), polyamides and related polymers Phenol formaldehyde resins (Bakelite, Novalac), Conducting Polymers,</p>		11

	[polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].	
Keywords	Average molecular mass, PDI, Dyes, Polymer, diazodyes, bismarkbrown, Vat dyes, indigo dyes.	

Signature of Convener & Members (CBoS):

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Bhatnagar, M. S. (2010). *A textbook of polymer chemistry*. S. Chand & Company.
2. Misra, G. S. (2004). *Introductory polymer chemistry*. New Age International Publishers & Distributors.
3. Gowariker, V. R., Vishvanathan, N. V., & Sreedhar, J. (2008). *Polymer science*. New Age International Publication.

Reference Books Recommended:

1. Braun, D., Cherdron, H., Rehahn, M., Ritter, H., & Voit, B. (Year). *Polymer synthesis: Theory and practice: fundamental method experiments (5th ed.)*. Springer.
2. Vogel, A. I. (Year). *A textbook of Organic Chemistry including Qualitative Organic Analysis*. Longman Publication.
3. Mann, F. G., & Saunders, B. C. (Year). *Organic Chemistry*. Pearson Publications.

Online Resources-

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

- https://onlinecourses.nptel.ac.in/noc22_cy53/preview
- <https://nptel.ac.in/courses/116104044>
- <http://ndl.iitkgp.ac.in/he document/swayam prabha/1tcmenbo3sk>
- <http://www.ndl.gov.in/he document/swayam prabha/cyvucniwcq>

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):	

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester-V	Session: 2024-2025
1	Course Code	CHSE-03P	
2	Course Title	DYES AND POLYMER CHEMISTRY LAB. COURSE	
3	Course Type	DSE	
4	Pre-requisite(if,any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To learn the synthesis of organic dyes in laboratory. ➤ To learn the synthesis of common drugs. ➤ To learn the synthesis of polymer. ➤ To make aware the student about polymer in our day to day life. 	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
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	<ol style="list-style-type: none"> 1. Synthesis of organic compound or dyes:- Methyl orange(azo coupling) phenolphthalein, Methyl red, Congo red, Fluorecein, Alizarin 2. Synthesis of drugs: Paracetamol, aspirin, sulphanilamide, Chlorobutanol, Tolbutamide, hexamine, 3. Synthesis of Some polymer or project work on some polymer: polyvinyl alcohol, Rayon,PVC,Nylon6, silicon based inorganic polymer, silicone, zeolite 4. Project work of identification of polymer around us in day to day life 		30
Keywords	<i>Synthesis of organic compound, Crude test, Limit test, Pharmaceutical Packaging.</i>		

Indira *Pratik* *D. Rish* *Arjun* *Sujani*
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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books:

1. Gupta, V. R., Kumar, R., & Gupta, A. (Year). *Organic Chemistry*. I. K. International Publishing House.
2. Bansal, R. K. (Year). *Industrial Organic Chemistry*. New Age International Publishers.
3. Kar, A. (Year). *Medicinal Chemistry*. New Age International Publishers.
4. Jain, A. K. (Year). *Introduction to Pharmaceutical Chemistry*. Pharma Book Publications.
5. Ghosh, B. (Year). *Polymer Chemistry*. New Age International Publishers.
6. Sinha, U. C., & Sinha, N. K. (Year). *Polymer Science*. Oxford University Press.

Reference Books:

1. Braun, D., Cherdron, H., Reham, M., Ritter, H., & Voit, B. (Year). *Polymer synthesis: Theory and practice: fundamental method experiments* (5th ed.). Springer.
2. Vogel, A. I. (Year). *A text book of Practical Organic Chemistry including Qualitative Organic Analysis*. Longman Publication London.
3. Mann, F. G., & Saunders, B. C. (Year). *Practical Organic Chemistry*. Pearson Publications.
4. Burrell, H. (Year). *Polymer Analysis*. John Wiley & Sons.
5. Griffiths, R. F. (Year). *Identification of Polymers*. John Wiley & Sons.

Online Resources:

- [https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/Organic_Chemistry_Labs/Experiments/1%3A_Synthesis_of_Aspirin_\(Experiment\)](https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/Organic_Chemistry_Labs/Experiments/1%3A_Synthesis_of_Aspirin_(Experiment))
- <https://edu.rsc.org/experiments/the-microscale-synthesis-of-azo-dyes/559.article#:~:text=In%20this%20experiment%2C%20students%20prepare,practical%20should%20take%2020%20minutes.>
- <https://www.scribd.com/doc/36584645/Polymers-Chemistry-Project>

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 G. Performed the Task based on lab. work - 20 Marks H. Spotting based on tools & technology (written) - 10 Marks I. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BOSC-05 T	
2	Course Title	Cytology & Genetics	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	<i>As per program</i>	
5	Course Learning Outcomes (CLO)	At the end of the course, the students will be able: ➤ Acquire knowledge of cell and its components. ➤ Learn about the structure and function of membrane and cell division ➤ Interpret Mendelian and non Mendelian genetics ➤ Interpret linkage, crossing over and gene interaction	
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	The cell, cell wall, plasma membrane : Cell structure and function; Characteristics of prokaryotic and eukaryotic cells; Structure, function and chemical composition of Plant cell wall. Plasma membrane structure and chemical nature; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament		12
II	Cell organelles, Division of Cell Mitochondria and Chloroplast; Structure and functions. Endoplasmic Reticulum – Structure, and functions, role in protein synthesis. Golgi Apparatus – organization, protein glycosylation, Lysosomes. Cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.		11
III	Mendelian genetics, Linkage and Crossing over; Mendelism: History; Principles of inheritance; terminology. Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Non-Mendelian inheritance: Incomplete dominance and co-dominance. Gene interaction; duplicate, complimentary, supplantmentry, epistasis. Linkage and crossing over.		11
IV	Extrachromosomal Inheritance, Mutation : Extrachromosomal inheritance: Cytoplasmic inheritance in plants. Mutations; types, Molecular basis of Mutations; Mutagens – physical and chemical. Chromosomal aberration: Deletion, Duplication, Inversion, Translocation, Euploidy and Aneuploidy.		11
Keywords	Cytology, Cell division, Genetics, Mendelian genetics, Mutation		

Signature of Convener & Members (CBoS) :

- ① R. S. Roy
- ② R. S. Roy
- ③ M. S. Datta
- ④ M. S. Datta
- ⑤
- ⑥
- ⑦
- ⑧
- ⑨
- ⑩

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Cell Biology: Powar C. B. and Dagainawala H. I., Himalay Pub. House, Bombay
2. Cell biology by Karp, G. 2010.
3. Cell and Molecular Biology: Concepts and Experiments: 6th Edition. John Wiley & Sons. Inc.
4. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition Lippincott Williams and Wilkins, Philadelphia.
5. Genetics by P. K. Gupta, Rastogi Publication
6. Gytogenetics, Molecular biology and Plant breeding by P. K. Gupta, Rastogi Publication

Reference Books Recommended–

1. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
3. Hausman, R.E. (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington,
4. D.C.; Sinauer Associates, MA. 9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009) The World of the Cell. 7 th edition. Pearson Benjamin Cummings Publishing, San Francisco

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.cytology-iac.org/educational-resources/virtual-slide-library>
- https://www.asct.com/ASCTWeb/Content/Cytopreparation_Online_Course.aspx
- <https://www.mooc-list.com/tags/genetics>
- <https://www.coursera.org/learn/genetics-evolution>
- <https://www.my-mooc.com/en/mooc/introduction-to-genetics-and-evolution>
- http://rastogipublications.com/index.php?route=product/product&product_id=50
- <https://www.nou.ac.in/sites/default/files/sim/BSCBO>
- http://ysmubooks.am/uploads/MEDICAL_BIOLOGY.pilf

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): 30 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE): 70	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	

Name and Signature of Convener & Members of CBoS:

① R. P. S. Rao
 ② S. K. S. Rao
 ③ A. S. Rao
 ④ A. S. Rao
 ⑤ A. S. Rao
 ⑥ S. K. S. Rao

⑦ S. K. S. Rao
 ⑧ S. K. S. Rao
 ⑨ S. K. S. Rao
 ⑩ S. K. S. Rao

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences (Degree/ Honours)		Semester - V	Session: 2024-2025
1	Course Code	BOSC-05	
2	Course Title	Lab. Course -05 (Cytology and Genetics)	
3	Course Type	Laboratory Course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to: <ul style="list-style-type: none"> ➤ Handle the Compound light Microscope and apply microscopy ➤ Achieve elaborate idea about cell staining procedures and mitotic plate observation & analysis ➤ Identify the various stages of cell division karyotype analysis Get practice of genetic crosses and genetic analysis. 	
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	1. Staining technique of cell organelles. 2. Study of different stages of Mitosis. 3. Study of different stages of Meiosis. 4. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum. 5. Demonstration of the phenomenon of protoplasmic streaming in <i>Hydrilla</i> leaves. 6. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) 7. Exercise on genetics (Mendelian ratio and test cross) 8. Karyotype of chromosomes. 9. Study of polytene and lampbrush chromosomes.	30	
Keywords	Mitosis, Mendelian ratio, Karyotype, Chromosome.		

Signature of Convener & Members (CBoS) :

- ① R. Sivan
- ② Arundh
- ③ Arundh
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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Laboratory Manual of Cyto-technique and Chromosome handling By Sharma A K
2. Manual of Cytology, Ministry of Health & Welfare
3. Cytogenetics By PK Gupta.
4. Cell biology By C. B. Powar

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

- e-Resources / e-books and e-learning portals
- https://ijrbat.in/upload_papers/0410202102153609.%20Basarkar%20UG%20and%20%20Patil-Behere%20KP.pdf
- <https://www2.samford.edu/~djohnso2/44962w/334/mitosis.html>
- <https://www.findel-international.com/product/science/biology/prepared-slides/philip-harris-prepared-microscope-slide-set-meiosis-and-mitosis-set-of-9-slides/e8r06642>

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): 15 (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05 Total Marks - 15	
End Semester Exam (ESE): 35	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	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	

Name and Signature of Convener & Members of CBoS:

- ① P. Bhowan
- ② Behera
- ③ Sharma
- ④ ...
- ⑤ ...
- ⑥ ...
- ⑦ ...
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- ⑨ ...
- ⑩ ...

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF BOTANY
COURSE CURRICULUM**

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BOSE -03 T	
2	Course Title	Phytopaleontology and Evolutionary Botany	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to > have a basic idea of fossils and process of fossilization > Describe how plants evolved including their origin and diversification > Summarize and evaluate information from scientific literature > Identify plat fossil through study of the remains of organisms, anatomical evidence and diversity > Understand and track evolution of species over millions of years identify transional forms of life > Understand how earth's environment has changed over geological time.	
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	Phytopaleontology- ❖ General account, ❖ Geological time scale; ❖ Brief account of process of fossilization & types of fossils and their study techniques; ❖ Fossils of algae, fungi, bryophytes		12
II	Fossils and India: ❖ Fossil plants: <i>Rhynia</i> , <i>Horneophyton</i> , <i>Williamsonia</i> , <i>Cycadeoidea</i> . ❖ Contribution of Prof. Birbal Sahni, - <i>Pentoxyles- Pentoxylon sahnii</i> ❖ Role of Indian Gondwana Flora in Chhattisgarh with reference to coal mines		11
III	Brief account of the families of Pteridospermales – ❖ Lyginopteridaceae, ❖ Medullosaceae, ❖ Caytoniaceae & > Glossopteridaceae		11
IV	General Account and Affinities – ❖ Cycadeoidales and Cordaitales. ❖ Paleozoic seeds ❖ Angiospermic and Gymnospermic fossils ❖ Uses of fossils ❖ Evolution : convergent, divergent and parallel evolution ❖ Telome concept		11
Keywords	Fossil, geological time table, gondwana flora, Telome		

Signature of Convener & Members (CBoS) :

① R. Singh
 ② Pandey
 ③ Singh
 ④ Singh
 ⑤ Singh
 ⑥ Singh
 ⑦ Singh
 ⑧ Singh
 ⑨ Singh
 ⑩ Singh

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Vashishtha, B. R. (2005) Pteridophytes S. Chand and Co., Delhi.
2. Vashishtha, B. R. (2005) Bryophytes S. Chand and Co., Delhi.
3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
4. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
5. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
6. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
8. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
9. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
10. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi .

Reference Books Recommended –

1. Kumar, H. D. (1988) introductory Phycology, Affiliated East-West Press Ltd., New Delhi.
2. Morris, I (1986) An Introduction to Algae, Cambridge Univ. Press, UK.
3. Puri, P. (1980) Bryophytes, Atma Ram and Sons, Delhi.
4. Sporne, K. K. (1991) The Morphology of Pteridophytes, B. I. Publishing Pvt. Ltd. Bombay.
5. Stewart, W. N. and Ruthwell, G. W. (1993) Paleobotany and the Evolution of Plants. Cambridge Univ. Press, UK.
6. Principles of Paleontology Edition 3 Paperback–1 January 2006 by Arnold Miller, Michael Foote Publishers - W.H.Freeman & Co Ltd

Online Resources–

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

1. <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/69611/1/Unit-9.pdf>
2. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/fossil-and-fossilization>
3. <https://palaeobotany.org>

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

- > www.swayam.ac.in
- > www.ignou.ac.in
- > www.egyankosh.ac.in
- > www.iitm.ac.in
- > www.eskillindia.org
- > www.eshiksha.mp.gov.in
- > www.vlab.co.in
- > www.internshala.com
- > www.ndl.iitkgp.ac.in

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): 30 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE): 70	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	

Name and Signature of Convener & Members of CBoS:

① K. Prasad
② K. Prasad
③ K. Prasad

④ K. Prasad
⑤ K. Prasad
⑥ K. Prasad

⑦ K. Prasad
⑧ K. Prasad
⑨ K. Prasad
⑩ K. Prasad

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Degree/ honors)</i>		Semester - V	Session: 2024-2025
1	Course Code	BOSE-03 P	
2	Course Title	Lab. Course -03 (Phytopaleontology and Evolutionary Botany)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<ol style="list-style-type: none"> 1. Understand evolutionary trends of plant development and diversification. 2. Study remnant of past and its natural conservation. 3. Phylogenetic relationship with the help of paleontological evidences 4. Understand role of fossil as an educational tool promoting science literacy an appreciation for earth's rich biological heritage. 	
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	<ol style="list-style-type: none"> 1) Study of important fossil of pteridophytes from prepared slides and specimens 2) Study of important fossil of gymnosperms from prepared slides and specimens 3) Study of important fossil of algae, fungi, bryophytes and angiosperms from prepared slides and specimens 4) Local trip to coal mines or fossil area for collection of fossil specimens and prepare study reports. 		30
Keywords	1) Fossil, slides and specimens		

Signature of Convener & Members (CBoS) :

① R. Shree	⑦ Jullina
② Devedes	⑧ Aniy
③ Mz	⑨ A
④ Jy	⑩ May
⑤ A. S.	
⑥ B. S.	

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Principles of Paleontology Edition 3 Paperback–1 January 2006 by Arnold Miller, Michael Foote Publishers - W.H.Freeman & Co Lt
2. The Practical Fossil Finder (Practical Handbook) Hardcover – 1 October 1991 by Steve Parker (Author) Publishers Facts On File Inc

Online Resources–

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

1. <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/696111/Unit-9.pdf>
2. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/fossil-and-fossilization>
3. <https://palaeobotany.org>

Online Resources–

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

- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

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): 15 (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE): 35	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

Name and Signature of Convener & Members of CBOS:

① Prof. ...
② ...
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSC – 05 T	
2	Course Title	Microbial Physiology and Metabolism	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course the student will able to – <ul style="list-style-type: none"> ➤ explain the growth characteristics of the microorganisms ➤ outline bacterial photosynthesis ➤ relate the translocation of metabolic products ➤ examine types of carbohydrate metabolism ➤ summarize lipid and amino acid metabolism 	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum 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	Microbial Growth: Definition, Generation time, Phases of growth curve, measurement of microbial growth, Batch culture, Continuous culture, synchronous growth, diauxic growth curve. Factors affecting the growth of microbes, Nutritional types of bacteria.		12
II	Bacterial photosynthesis: Photosynthetic pigments- bacteroid chlorophyll, carotenoids, bacteriorhodopsin and phycobilins. Photosynthetic bacteria- purple sulphur bacteria, purple non- sulphur bacteria, green sulphur bacteria & Green non-sulphur bacteria, heliobacteria Membrane transport: Passive and facilitated diffusion. active transport, concept of uniport, symport and antiport Group translocation.		11
III	Carbohydrate metabolism: Glycolysis, TCA cycle, ED, Pentose phosphate pathway. Electron transport chain: components of ETC, Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation. Glycogenolysis, Gluconeogenesis.		11
IV	Lipid catabolism: alpha, beta and omega oxidation of fatty acids. Amino acid catabolism: Deamination, Transamination and Decarboxylation of amino acids. Urea cycle.		11
Key Words	Microbial growth, Photosynthetic bacteria, carbohydrate metabolism, lipid catabolism		

Name and Signature of Convener and Members of CBoS

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Roshmi
10.6.24

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Dr. Nelson Xer

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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. General Microbiology; Vol II C B Pawar & H F Dagainawala.
2. A textbook of Microbiology; R C Dubey & D K Maheshwari.
3. Fundamentals of Biochemistry; J.L. Jain, Dr. Sunil Jain and Nitin Jain, S. Chand Pub.
4. Biochemistry; U. Satyanarayana and U. Chakrapani

Reference Books:

1. Microbiology; Prescott, Harley and Klein, 5th edition, Mc Graw Hill, New York .
2. Brock Biology of Microorganisms; Madigan.
3. Bacterial physiology; Moat & Foster.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://byjus.com/biology/carbohydrate-metabolism/>
- <https://www.slideshare.net/subramaniansethupath/overview-of-lipid-metabolism.>
- <https://www.britannica.com/science/bacteria/Growth-of-bacterial-populations>

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	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS

Sum
10.6.24

Roshmi
10.6.24

D
10.6.24

Dr. Nelson Ke
10/6/24

Plal
10/6/24

Arul
10.6.24

Sandhana
10-6-24

P. N. A. A. E.
10/6/24

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester V	Session: 2024-25
1	Course Code	MBSC - 05 P	
2	Course Title	Lab. Course - MBSC - 05	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course the student will able to – <ul style="list-style-type: none"> ➤ relate the growth pattern of bacteria ➤ determine the effect of various environmental factors on growth of microorganisms ➤ apply the factors for microbial control ➤ demonstrate the fermentation process 	
6	Credit Value	1 Credit	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	1. Study of growth curve of bacteria by turbidometric and standard plate count methods. 2. Calculations of generation time and specific growth rate of bacteria from the graph. 3. Effect of temperature/ pH/ salt on growth of bacteria. 4. Demonstration of alcoholic fermentation. 5. Demonstration of the thermal death time and decimal reduction time of <i>E.coli</i> . 6. Isolation of Saccharophilic (starch hydrolysis), Proteolytic (casein and gelatin hydrolysis) and Lipolytic microorganisms. 7. Oxidative and Fermentative test of bacteria.	30
Key Words	Growth Curve, Generation time, Factors of Growth, Fermentation, Microbial Enzymes	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Experiments in microbiology, plant pathology and biotechnology by K R Aneja
2. Practical microbiology by R C Dubey and D K Maheshwari.

Online Resources:

- https://books.google.co.in/books/about/Practical_Microbiology.html?id=Wh9OTbjcsfUC&redir_esc=y
- **Practical Microbiology: Microbial Physiology and Biochemistry**

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

Name and Signature of Convener and Members of CBoS

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Dand
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Rashmi
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSE-03 T	
2	Course Title	Food and Dairy Microbiology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ define the significance and activities of microorganisms in food ➤ relate the principles in traditional food preservation techniques ➤ identify the starter cultures of different microbial food products ➤ explain the types of food intoxications ➤ examine the food born infections 	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum 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 food and dairy Microbiology: Importance of studying food and dairy microbiology, Traditional and ayurvedic foods of Indian origin, Classification of food in relation to shelf life. Microbial spoilage: principles, Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.	12
II	Principles and methods of food preservation: Physical methods of food preservation: temperature, Pasteurization, canning, drying, High pressure and Irradiation; chemical methods of food preservation: salt, sugar, organic acids, SO ₂ and antibiotics.	11
III	Microbiology of fermented milk and fermented food: Starter lactic cultures, fermented milk products- yogurt, butter and cheese, other fermented foods- idly, bread. Microorganisms as food- Mushroom. Prebiotics and Probiotics- definition and uses.	11
IV	Food borne diseases: food poisoning, food infections and intoxications. Causative agents, symptoms and preventive measures. Food intoxications: Clostridium botulinum and mycotoxins; Food infections: <i>Bacillus cereus</i> , <i>Escherichia coli</i> , <i>Shigella</i> , <i>Listeria monocytogenes</i> .	11
Key Words	Preservation, Food borne diseases, Food intoxications, Microbial spoilage, Prebiotics, Probiotics	

Name and Signature of Convener and Members of CBoS

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Biochemistry of milk products: Andrews AT, Varley J. (1994). Royal Society of Chemistry.
2. Food microbiology: Banwart GJ. (1989)
3. A textbook of Microbiology: R. C. Dubey and Maheshwari, S Chand publications.
4. Food Microbiology, 5th Edition; William C. Frazier, Dennis C. Westhoff and N.M. Vanitha

Reference Books:

1. Basic food microbiology: Chapman & Hall, New York.
2. Modern Food Microbiology: Jay JM, Loessner MJ and Golden DA. (2005).7th edition, CBS Publishers and Distributors, Delhi
3. Food Microbiology: Adams MR and Moss MO. (1995)., Cambridge.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://bookarchive.net/pdf/industrial-microbiology-by-i-e-casida-ir/>
- <http://foodhaccp.com/foodsafetymicro/onlineindex.html>
- https://sist.sathyabama@ac.in/sist_coursematerial/uploads/SMB2203.pdf
- <http://www.cpe.rutgers.edu/courses/current/If0401wa.html>
- <https://www.classcentral.com/course/swayam-food-microbiology-and-food-safety-17609>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

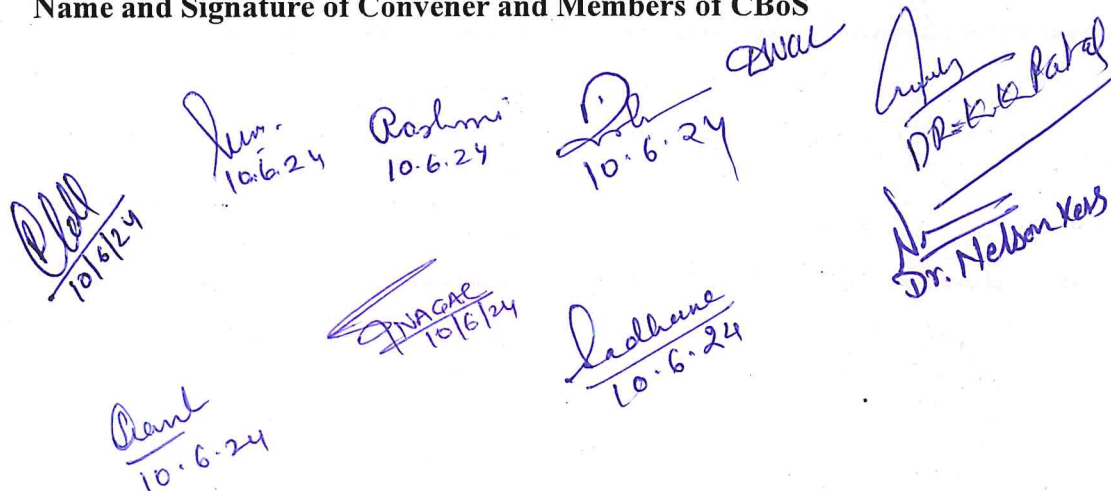
Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS


The image shows several handwritten signatures and dates in blue ink. The signatures are: 1. A signature with the date 10/6/24. 2. A signature with the date 10.6.24. 3. A signature with the date 10.6.24. 4. A signature with the date 10.6.24. 5. A signature with the date 10.6.24. 6. A signature with the date 10.6.24. 7. A signature with the date 10.6.24. 8. A signature with the date 10.6.24. 9. A signature with the date 10.6.24. 10. A signature with the date 10.6.24. 11. A signature with the date 10.6.24. 12. A signature with the date 10.6.24. 13. A signature with the date 10.6.24. 14. A signature with the date 10.6.24. 15. A signature with the date 10.6.24. 16. A signature with the date 10.6.24. 17. A signature with the date 10.6.24. 18. A signature with the date 10.6.24. 19. A signature with the date 10.6.24. 20. A signature with the date 10.6.24. 21. A signature with the date 10.6.24. 22. A signature with the date 10.6.24. 23. A signature with the date 10.6.24. 24. A signature with the date 10.6.24. 25. A signature with the date 10.6.24. 26. A signature with the date 10.6.24. 27. A signature with the date 10.6.24. 28. A signature with the date 10.6.24. 29. A signature with the date 10.6.24. 30. A signature with the date 10.6.24. 31. A signature with the date 10.6.24. 32. A signature with the date 10.6.24. 33. A signature with the date 10.6.24. 34. A signature with the date 10.6.24. 35. A signature with the date 10.6.24. 36. A signature with the date 10.6.24. 37. A signature with the date 10.6.24. 38. A signature with the date 10.6.24. 39. A signature with the date 10.6.24. 40. A signature with the date 10.6.24. 41. A signature with the date 10.6.24. 42. A signature with the date 10.6.24. 43. A signature with the date 10.6.24. 44. A signature with the date 10.6.24. 45. A signature with the date 10.6.24. 46. A signature with the date 10.6.24. 47. A signature with the date 10.6.24. 48. A signature with the date 10.6.24. 49. A signature with the date 10.6.24. 50. A signature with the date 10.6.24. 51. A signature with the date 10.6.24. 52. A signature with the date 10.6.24. 53. A signature with the date 10.6.24. 54. A signature with the date 10.6.24. 55. A signature with the date 10.6.24. 56. A signature with the date 10.6.24. 57. A signature with the date 10.6.24. 58. A signature with the date 10.6.24. 59. A signature with the date 10.6.24. 60. A signature with the date 10.6.24. 61. A signature with the date 10.6.24. 62. A signature with the date 10.6.24. 63. A signature with the date 10.6.24. 64. A signature with the date 10.6.24. 65. A signature with the date 10.6.24. 66. A signature with the date 10.6.24. 67. A signature with the date 10.6.24. 68. A signature with the date 10.6.24. 69. A signature with the date 10.6.24. 70. A signature with the date 10.6.24. 71. A signature with the date 10.6.24. 72. A signature with the date 10.6.24. 73. A signature with the date 10.6.24. 74. A signature with the date 10.6.24. 75. A signature with the date 10.6.24. 76. A signature with the date 10.6.24. 77. A signature with the date 10.6.24. 78. A signature with the date 10.6.24. 79. A signature with the date 10.6.24. 80. A signature with the date 10.6.24. 81. A signature with the date 10.6.24. 82. A signature with the date 10.6.24. 83. A signature with the date 10.6.24. 84. A signature with the date 10.6.24. 85. A signature with the date 10.6.24. 86. A signature with the date 10.6.24. 87. A signature with the date 10.6.24. 88. A signature with the date 10.6.24. 89. A signature with the date 10.6.24. 90. A signature with the date 10.6.24. 91. A signature with the date 10.6.24. 92. A signature with the date 10.6.24. 93. A signature with the date 10.6.24. 94. A signature with the date 10.6.24. 95. A signature with the date 10.6.24. 96. A signature with the date 10.6.24. 97. A signature with the date 10.6.24. 98. A signature with the date 10.6.24. 99. A signature with the date 10.6.24. 100. A signature with the date 10.6.24.

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSE-03 P	
2	Course Title	Lab. Course - MBSE-03	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ illustrate methods for isolation, detection and identification of microorganisms from food samples ➤ outline the spoilage microorganisms of food ➤ compare the effect of temperature on the spoilage of food products ➤ relate the parts of mushrooms 	
6	Credit Value	1 Credit	<i>Credit = 30 Hours. Laboratory or Field learning/ Training</i>
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	1. Isolation of spoilage microorganisms from bread. 2. MBRT of milk samples and their standard plate count. 3. Isolation of bacteria and fungi from food products. 4. Microbiological examination of canned foods. 5. Isolation of spoilage bacteria from fruits and vegetables. 6. Effect of temperature on the spoilage of food products. 7. Microbiological examination of mushrooms. 8. Microbiological examination of packaged food.	30	
Key Words	Spoilage microorganisms, Food borne bacteria, Food borne fungi, Canned food		
PART – C: Learning Resources			
Text Books, Reference Books and Others			
Text Books Recommended:			
1. Practical Microbiology: Dubey and Maheshwari. D.K., S. Chand & Company, Pvt. Ltd., New Delhi. 2. Laboratory experiments in Microbiology: Gopal Reddy 3. Microbiology Laboratory Manual: Cappuccino, Sherman, Pearson Education.			
Online Resources:			
<ul style="list-style-type: none"> • http://www.onlinelabs.in • http://www.vlab.co.in • http://www.vlab.amrita.edu 			
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	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/ Seminar + Attendance:	05	
	Total Marks:	15	
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

Name and Signature of Convener and Members of CBoS

Convener: *[Signature]* 10/6/24
 Members: *[Signatures]* 10/6/24

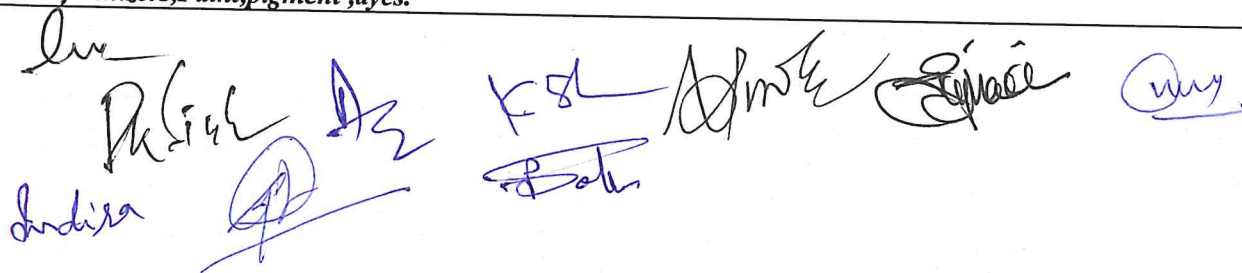
FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science <i>(Certificate / Diploma / Degree/Honors)</i>		Semester-I/III/V	Session: 2024-2025
1	Course Code	CHVAC	
2	Course Title	Chemistry in Daily Life	
3	Course Type	Value Added Course(VAC)	
4	Pre-requisite(if,any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ <i>To introduce the student about dairy product, beverages, food additives, artificial sweeteners, flavors, food colorants, paints, pigments, dyes etc.</i> ➤ <i>To make aware the students about air pollution, hydrological cycle, composition of soil, fertilizers etc.</i> ➤ <i>To introduce the students about carbohydrate, vitamins, drugs.</i> ➤ <i>To introduce students about concept of thermodynamics used in day to day life.</i> 	
6	Credit Value	2 Credits	<i>Credit = 15 Hours -learning & Observation</i>
7	Total Marks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
TotalNo.of Teaching-learning Periods(01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics(Course contents)		No. of Period
I	<p>Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk.</p> <p>Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, estimation of methyl alcohol in alcoholic beverages.</p> <p>Food additives, adulterants and contaminants: Food preservatives like benzoates, propionates, sorbates, disulphites.</p> <p>Artificial sweeteners: spartame, saccharin, dulcin, sucralose and sodium cyclamate.</p> <p>Flavors: Vanillin, alkyl esters (fruit flavours) and monosodium glutamate. Artificial food colorants: Coal tar dyes and non-permitted colours and metallic salts. Analysis of pesticide residues in food.</p> <p>Paints & Pigments: White pigments (white lead, ZnO, lithopone, TiO₂). Blue, red, yellow and green pigments. Paints and distempers: Requirement of a good paint. Emulsion, latex; luminescent paints. Fire retardant paints and enamels, lacquers. Solvents and thinners for paints.</p> <p>Dyes: Colour and constitution (electronic concept). Classification of dyes. Methods of applying dyes to the fabrics. A general study of azo dyes, Mordant brown, Congo red and methyl orange.</p>		08
II	<p>Air Pollution: Air pollutants, prevention and control, Greenhouse gases and acid rain. Ozone hole and CFC's. Photochemical smog and PAN. Catalytic converters for mobile sources. Bhopal gas tragedy.</p> <p>Hydrologic cycle, sources, criteria and standards of water quality - safe drinking water. Public health significance and measurement of water quality parameters - (Colour, turbidity, total solids, acidity, alkalinity, hardness, sulphate, fluoride, phosphate, nitrite, nitrate, BOD and COD).</p> <p>Water purification for drinking and industrial purposes. Toxic chemicals in the environment. Detergents - pollution aspects, eutrophication. Pesticides and insecticides - pollution aspects. Heavy metal pollution. Solid pollutants - treatment and disposal. Treatment of industrial liquid wastes. Sewage and industrial effluent treatment.</p>		07

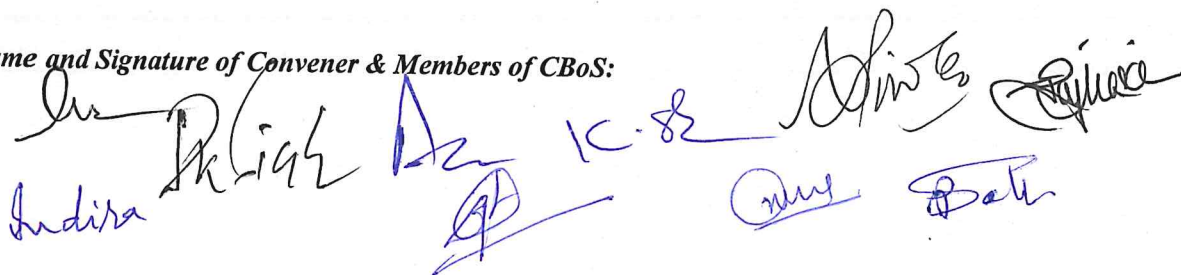
	<p>Composition of soil – inorganic and organic components in soil - micro and macronutrients.</p> <p>Fertilizers: Classification of fertilizers - Straight Fertilizers, Compound/Complex Fertilizers, Fertilizer Mixtures. Manufacture and general properties of fertilizer products - Urea and DAP.</p>	
III	<p>Carbohydrates: Structure, function and Chemistry of some important mono and disaccharides.</p> <p>Vitamins: Classification and Nomenclature. Sources, deficiency diseases and structures of Vitamin A₁, Vitamin B₁, Vitamin C, Vitamin D, Vitamin E & Vitamin K₁.</p> <p>Drugs: Classification and nomenclature.</p> <p>Structure and function of: <i>Analgesics</i> – aspirin, paracetamol.</p> <p><i>Anthelmintic drug:</i> mebendazole.</p> <p><i>Antiallergic drug:</i> Chlorpheniramine maleate.</p> <p><i>Antibiotics:</i> Penicillin V, Chloramycetin, Streptomycin.</p> <p><i>Anti-inflammatory agent:</i> Oxypheno-butazone.</p> <p><i>Antimalarials:</i> Primazquine phosphate & Chloroquine.</p> <p>Oils and fats: Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like aregemone oil and mineral oils.</p> <p>Soaps & Detergents: Structures and methods of use of soaps and detergents.</p>	08
IV	<p>Chemical Thermodynamics: Concept of fugacity and free energy, Activity and activity coefficient, spontaneity of processes-entropy and free energy changes. Partial molar quantities, colligative properties, Le-Chatelier principle, phase equilibrium. Enzyme catalyzed reactions.</p> <p>Principles of Reactivity: Basis kinetic concepts, rates of simple and complex chemical reactions, empirical rate equations. Temperature dependence of rates and activation parameters. Branched chain reactions – explosion limits. Oscillatory reactions.</p> <p>Chemical energy system and limitations, principles and applications of primary & secondary batteries and fuel cell. Basics of solar energy, future energy storer. aerospace materials. Problems of plastic waste management. Strategies for the development of environment friendly polymers.</p>	08
Keywords	<p><i>Air pollution, carbohydrate, vitamins, LeChatteliar's law, Dairy product, artificial sweeteners. fertilizers, Paint, pigment, dyes.</i></p>	



Signature of Convener & Members (CBoS):

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended:		
1. Sharma, B. K. (1998). <i>Introduction to Industrial Chemistry</i> . Meerut: Goel Publishing.		
2. Many, N. S., & Swamy, S. (1998). <i>Foods: Facts and Principles (4th ed.)</i> . New Age International.		
3. Kar, A. (2022). <i>Medicinal Chemistry</i> . NEW AGE International Pvt Ltd		
Reference books Recommended:		
1. <i>Drugs and Pharmaceutical Sciences Series</i> . (Year). Marcel Dekker, Vol. II. New York: INC.		
2. Atkins, P., & de Paula, J. (2002). <i>Physical Chemistry (7th ed.)</i> . Oxford University Press.		
3. Swaminathan, & Goswamy. (2001). <i>Handbook on Fertilizer Technology (6th ed.)</i> . FAI.		
4. Finar, I. L. (Year). <i>Organic Chemistry (Vol. 1&2)</i> .		
5. Fired, J. R. (Year). <i>Polymer Science and Technology</i> . Prentice Hall.		
Online Resources:		
https://onlinecourses.swayam2.ac.in/nos22_sc23/preview		
https://www.researchgate.net/publication/343585969_Chemistry_in_Everyday_Life		
https://www.youtube.com/watch?v=P3p1C87gc0U		
https://www.slideshare.net/sanjaijosephManesh/food-chemistry-51688453		
PART-D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment(CIA):15 Marks		
End Semester Exam(ESE):35Marks		
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):	Two section – A & B Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x05=20Marks	

Name and Signature of Convener & Members of CBoS:



 Indira

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

PART- A: Introduction			
Program: Bachelor in Science <i>(Certificate / Diploma / Degree/Honors)</i>		Semester - I / III / V	Session: 2024-2025
1	Course Code	BCVAC- 01	
2	Course Title	Ethno Medicine in Chhattisgarh	
3	Course Type	Value added Course	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> ➤ Explain the basic components of Medicinal plant. ➤ Summarize the bioactive compound in herbs. ➤ Recognize the disorder and ethno medicine for it. ➤ Understand the effect of bioactive compound on the disease as well as interpret the effect of toxic chemicals on body parts and their cure. 	
6	Credit Value	2 Credits	<i>Credit = 15 Hours - learning & Observation</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Historical perspective, scope and future prospects. Scrutinizing the term 'Ethno medicine'. Common and crucial Medicinal Plants in Chhattisgarh: Ethno medicine in India.		07
II	Properties and functions of photochemical and their medicinal effects - Glucosamine, Octacosanol, Lycopene, Flavonoids, Carnitine, Melatonin and Ornithine alpha, ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Medicine.		08
III	Disease and Ethno medicine; Common Herbal/ House hold/ food used as Medicines in in treatment for cognitive decline. Herbal/ House hold/ food used as Medicines for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc.		07
IV	Brief idea about Medicinal effect of some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.		08
Keywords	Phytochemical, Nutraceuticals, Herbal Medicine, Disorders, Disease.		

Name and Signature of Convener & Members of CBoS:

PART-C: Learning Resources		
Text Books, Reference Books and Others		
<i>Text Books Recommended –</i>		
<ul style="list-style-type: none"> ➤ 1. Gopalan C., et al Dietary Allowances for Indians, NIH, Hyderabad. ➤ 2. Anita F.P. Clinical Dietetics and Nutrition, 4th Ed, 1997, ➤ 3. Devlin, T.M. Text Book of Biochemistry with Clinical Correlation, ➤ 4. Mahan, L.K. & Ecott- Stump, S. [Ed.] Krause's Food, Nutrition and Diet Therapy . 		
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):	Two section – A & B Section A: Q1. Objective – 05 x1= 05 Mark ; Q2. Short answer type- 5x2 =10 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x05 =20 Marks	

Name and Signature of Convener & Members of CBoS: