



शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर

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क्रमांक / 738 / ब.वि.वि./अका./2021 जगदलपुर, दिनांक 02/09/2021

प्रति,

1. प्राचार्य,
समस्त संबद्ध शासकीय एवं अशासकीय महाविद्यालय,
2. विभागाध्यक्ष, समस्त अध्ययनशाला,
शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर,
जगदलपुर, जिला-बस्तर (छ.ग.)

02 SEP 2021

विषय :- सत्र 2021-22 में स्नातक भाग-तीन/तृतीय वर्ष/अंतिम के नवीन/संशोधित पाठ्यक्रम के संबंध में।

संदर्भ :- संयुक्त संचालक, उच्च शिक्षा संचालनालय, इन्द्रावती भवन, अटल नगर रायपुर का पत्र क्रमांक /2456/315/आउशि/समन्वय/2019 दिनांक 16/05/2019 एवं विश्वविद्यालय के संदर्भित पत्र के माध्यम से संशोधित पाठ्यक्रम को सत्र 2019-20 में स्नातक स्तर के प्रथम वर्ष/भाग-एक का पत्र क्रमांक/5251/अका./ब.वि.वि./2019 जगदलपुर, दिनांक 03/07/2019 तथा पत्र क्रमांक/791/अका./ब.वि.वि./2020 जगदलपुर, दिनांक 09/11/2020

उपर्युक्त विषयान्तर्गत लेख है कि केन्द्रीय अध्ययन मंडल के प्रस्ताव अनुसार छत्तीसगढ़ शासन, उच्च शिक्षा विभाग द्वारा स्नातक स्तर के प्रथम वर्ष/भाग-एक, द्वितीय वर्ष/भाग-दो एवं तृतीय वर्ष/भाग-तीन के पाठ्यक्रमों में सत्र 2019-20 से परिवर्तन किया है। बस्तर विश्वविद्यालय, जगदलपुर के संदर्भित पत्र के माध्यम से संशोधित पाठ्यक्रम को सत्र 2019-20 में स्नातक स्तर के प्रथम वर्ष/भाग-एक एवं सत्र 2020-21 में स्नातक स्तर के द्वितीय वर्ष/भाग-दो के लिए लागू किये जाने की सूचना प्रेषित किया गया था।

सत्र 2021-22 में स्नातक स्तर के तृतीय वर्ष/भाग-तीन/अंतिम वर्ष के लिए नवीन/संशोधित पाठ्यक्रम को लागू किया गया है। शैक्षणिक सत्र 2021-22 प्रारंभ होने के फलस्वरूप वर्तमान सत्र में स्नातक स्तर के तृतीय वर्ष/भाग-तीन/अंतिम वर्ष के लिए नवीन/संशोधित पाठ्यक्रम अनुसार ही अध्ययन अध्यापन, परीक्षा, मूल्यांकन आदि कार्य सम्पादित करेंगे। स्नातक स्तर के प्रथम वर्ष/भाग-एक एवं द्वितीय वर्ष/भाग-दो के पाठ्यक्रम विगत सत्र के अनुसार यथावत रहेंगे।

पाठ्यक्रमों की एक प्रति महाविद्यालयों/अध्ययनशालाओं को ई-गेल के माध्यम से प्रेषित किया जा रहा है। साथ ही विश्वविद्यालय के वेबसाइट पर भी अपलोड कराया गया है, जिसका अवलोकन समस्त महाविद्यालय/अध्ययनशाला के शिक्षक एवं छात्र-छात्राएँ कर सकते हैं। भविष्य में छ.ग.शासन, उच्च शिक्षा विभाग अथवा उच्च शिक्षा संचालनालय द्वारा स्नातक स्तर के पाठ्यक्रमों के संबंध में किसी प्रकार का आदेश/निर्देश प्राप्त होने पर विश्वविद्यालय द्वारा यथासमय अवगत कराया जाएगा।

संलग्न :- उपरोक्तानुसार

कुलसचिव
 शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर
 जगदलपुर, जिला-बस्तर (छ.ग.)

पृ. क्रमांक / 739 / ब.वि.वि./अका./2021
 प्रतिलिपि :-

01. सचिव, छत्तीसगढ़ शासन, उच्च शिक्षा विभाग, मंत्रालय, महानदी भवन, नवा रायपुर अटल नगर, जिला-रायपुर की ओर सूचनार्थ प्रेषित।
02. आयुक्त, उच्च शिक्षा संचालनालय, ब्लॉक-सी 30, द्वितीय एवं तृतीय तल, इन्द्रावती भवन, नवा रायपुर अटल नगर, जिला-रायपुर की ओर सूचनार्थ प्रेषित।
03. माननीय कुलपति महोदय, शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर जगदलपुर की ओर सूचनार्थ प्रेषित।
04. क्षेत्रीय अपर संचालक, उच्च शिक्षा, शासकीय काकतीय स्नातकोत्तर महाविद्यालय, जगदलपुर की ओर सूचनार्थ प्रेषित।
05. सहायक कुलसचिव, (गोपनीय/परीक्षा) शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर, जगदलपुर को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

सहायक कुलसचिव (अकादमिक)
 शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर
 जगदलपुर, जिला-बस्तर (छ.ग.)

सहायक कुलसचिव (अकादमिक)
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 जगदलपुर, जिला-बस्तर (छ.ग.)

B.A./B.Sc. Part-III

MATHEMATICS

There shall be three theory papers. Two compulsory and one optional. Each paper carrying 50 marks is divided into five units and each unit carry equal marks.

B.A./B.Sc. Part-III

PAPER - I

ANALYSIS

REAL ANALYSIS

UNIT-I Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's test. Multiplication of series. Double series. Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions.

UNIT-II Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests. Abel's and Dirichlet's tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.

COMPLEX ANALYSIS

UNIT-III Complex numbers as ordered pairs. Geometrical representation of complex numbers. Stereographic projection. Continuity and differentiability of complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed points, Cross ratio. Inverse points and critical mappings. Conformal mappings.

METRIC SPACES

UNIT-IV Definition and examples of metric spaces. Neighborhoods, Limit points, Interior points, Open and Closed sets, Closure and interior. Boundary points, Sub-space of a metric space. Cauchy sequences, Completeness, Cantor's intersection theorem. Contraction principle, construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.

UNIT-V Dense subsets. Baire Category theorem. Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity, isometry and homeomorphism. Equivalent metrics. Compactness, sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and Compact sets, Connectedness, Components, Continuous functions and Connected sets.

REFERENCES:

1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Real Analysis, Oxford & IBH publishing Co., New Delhi, 1970.
3. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
4. D. Somasundaram and B. Chaudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co. New Delhi.
6. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
7. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw- Hill, New York, 1990.
8. Mark J. Ablowitz and A.S. Fokas, Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
9. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.
10. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
11. P.K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House, New Delhi, 1996.
12. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 1963.

**B.A./B.Sc. Part-III
MATHEMATICS
PART - II
ABSTRACT ALGEBRA**

- UNIT-I** Group-Auto orphisms, inner auto orphism. Auto orphism of groups and their computations, Contumacy relation, Normalize, Counting principle and the class equation of a finite group. Center for Group of prime-order, Abelianizing of a group and its universal property. Sylow's theorems, Sylow subgroup, Structure theorem for finite Abelian groups.
- UNIT-II** Ring theory-Ring homomorphism. Ideals and quotient rings. Field of quotients of an integral domain, Euclidean rings, polynomial rings, Polynomials over the rational field. The Eisenstein criterion, polynomial rings over commutative rings, Unique factorization domain. R unique factorization domain implies so is $R[x_1, x_2, \dots, x_n]$. Modules, Sub modules, Quotient modules, Homomorphism and Isomorphism theorems.
- UNIT-III** Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.
- UNIT-IV** Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Ad joint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms.
- UNIT-V** Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

REFERENCES:

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. N. Jacobson, Basic Algebra, Vols. I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Shanti Narayan, A Text Book of Modern Abstract Algebra, S.Chand & Co. New Delhi.
4. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.
6. K. Hoffman and R. Kunze, Linear Algebra, (2nd Edition), Prentice Hall. Englewood Cliffs, New Jersey, 1971.
7. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic Linear Algebra with MATLAB. Key College Publishing (Springer-Verlag) 2001.
8. S. Kumaresan, Linear Algebra, A Geometric Approach, Prentice-Hall of India, 2000.
9. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1997.
10. I.S. Luther and I.B.S.Passi, Algebra, Vol. I-Groups, Vol. II-Rings. Narosa Publishing House (Vol. I-1996, Vol. II-1999)
11. D.S. Malik, J.N. Mordeson, and M.K. Sen, Fundamentals of Abstract Algebra, McGraw- Hill International Edition, 1997.

**B.A./B.Sc. Part-III
MATHEMATICS
PAPER - III (OPTIONAL)
(I) PRINCIPLES OF COMPUTER SCIENCE**

- UNIT-I** **Data Storage** - Storage of bits, Main Memory, Mass Storage, Coding Information of Storage, The Binary System, Storing integers, storing fractions, communication errors.
Data Manipulation - The Central Processing Unit, The Stored-Program Concept, Programme Execution, Other Architectures, Arithmetic/Logic Instructions, Computer-Peripheral Communication.
- UNIT-II** **Operating System and Networks** - The Evolution of Operating System, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Process, Networks, Networks Protocol.
Software Engineering - The Software Engineering Discipline, The Software Life Cycle, Modularity, Development Tools and Techniques, Documentation, Software Ownership and Liability.
- UNIT-III** **Algorithms** - The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery, Iterative Structures, Recursive Structures, Efficiency and Correctness, (Algorithms to be implemented in C++). **Programming Languages** - Historical Perspective, Traditional Programming Concepts, Program Units, Language Implementation, Parallel Computing, Declarative Computing.
- UNIT-IV** **Data Structures** - Arrays, Lists, Stacks, Queues, Trees, Customised Data Types, Object Oriented Programming.
File Structure - Sequential Files, Text Files, Indexed Files, Hashed Files, The Role of the Operating System.
Database Structure - General Issues, The Layered Approach to Database Implementation, The Relational Model, Object-Oriented Database, Maintaining Database Integrity, E-R models
- UNIT-V** **Artificial Intelligence** - Some Philosophical Issues, Image Analysis, Reasoning, Control System Activities, Using Heuristics, Artificial Neural Networks, Application of Artificial Intelligence.
Theory of Computation - Turning Machines, Computable functions, A Non computable Function, Complexity and its Measures, Problem Classification.

REFERENCES:

1. J. Glen Brook hear, Computer Science: An Overview, Addison -Wesley.
2. Stanley B. Lippmann, Josee Lojoie, C++ Primer (third Edition), Addison-Wesley.

B.A./B.Sc. Part-III
MATHEMATICS
PAPER - III (OPTIONAL)
(II) DISCRETE MATHEMATICS

- UNIT-I** **Sets and Propositions** - Cardinality. Mathematical Induction, Principle of inclusion and exclusion. **Computability and Formal Languages** - Ordered Sets. Languages. Phrase Structure Grammars. Types of Grammars and Languages. Permutations. Combinations and Discrete Probability.
- UNIT-II** **Relations and Functions** - Binary Relations, Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle.
Graphs and Planar Graphs - Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Planner Graphs. Trees.
- UNIT-III** **Finite State Machines** - Equivalent Machines. Finite State Machines as Language Recognizers. **Analysis of Algorithms** - Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions.
- UNIT-IV** **Recurrence Relations and Recursive Algorithms** - Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Particular Solution. Total Solution. Solution by the Method of Generating Functions. Brief review of Groups and Rings.
- UNIT-V** **Boolean Algebras** - Lattices and Algebraic Structures. Duality, Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Propositional Calculus. Design and Implementation of Digital Networks. Switching Circuits.

REFERENCES:

1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science Series, 1986