# CURRICULUM FOR INTEGRATED TEACHER EDUCATION PROGRAMME LEADING TO B. Sc. B.Ed. DEGREE

| Name of Degree | Name of Specialization | Total Intake (Full-time) | Year of Starting | Duration | Eligibility for Admission |
|---|---|---|---|---|---|
| **B.Sc. B.Ed. (Secondary)** | Science and Education | 50 | 2023 | 4 years (8 semesters) | The ITEP shall be of four academic years comprising eight semesters including internship (field-based experiences and practice teaching). Candidates with minimum fifty percent marks in Senior Secondary or plus two examination or its equivalent (under 5+3+3+4 pattern) from a recognized board are eligible for admission through the National Common Entrance Test (NCET), conducted by the National Testing Agency (NTA) |

**COURSE CATEGORIES AND CREDIT REQUIREMENTS:**

The structure of B.Sc.B.Ed. Programmes shall have the following Course Categories:

| Sl. No | Course Category | No. of Courses | No. of credits |
|---|---|---|---|
| 1. | Foundations of Education (FE) | 10 | 30 |
| 2. | Disciplinary Major and Minor (MM) | 16 | 80 |
| 3. | Stage Specific Content cum Pedagogy (CP) | 4 | 16 |
| 4. | Ability Enhancement and Value added Courses (AE) | 12 | 28 |
| 5. | School Experience (SE) | 6 | 20 |
| 6. | Community Engagement and Service (CE) | 1 | 2 |

**Total Credits required: 176**

## PROGRAMME STRUCTURE

### Major Disciplinary Subject: MATHEMATICS

**Minor:** One discipline to be chosen from amongst Physics, Chemistry, Botany, Zoology and Economics.

The effort to be put in by the student is indicated in the tables below as follows:
**L**: Lecture (One unit is of 50-minute duration)
**T**: Tutorial (One unit is of 50-minute duration)
**P**: Practical (One unit is of one-hour duration)
**O**: Outside the class effort / self-study (One unit is of one-hour duration)

### Semester 1

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED1001E | Evolution of Indian Education | 4 | 0 | 0 | 8 | 4 | FE |
| 2 | ED1002E | Language I – English | 4 | 0 | 0 | 8 | 4 | AE |
| 3 | ED1003E | Art Education-Collage Making | 1 | 0 | 2 | 3 | 2 | AE |
| 4 | ED1004E | Understanding India -I | 2 | 0 | 0 | 4 | 2 | AE |
| 5 | ED1201E | Set theory and logic | 3 | 1 | 0 | 8 | 4 | MM |
| 6 | ED1103E | Chemistry Minor-I Basics of Theoretical Chemistry and Spectroscopy | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1303E | Physics Minor-I Mechanics, Waves and Oscillations | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1401E | Botany Minor-I Cell Biology and Biochemistry | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1501E | Zoology Minor-I Cell Biology | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1601E | Economics Minor-I Basic Economics | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 20 | |

### Semester 2

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED1011E | Language II- Malayalam | 4 | 0 | 0 | 8 | 4 | AE |
| | ED1014E | Language II- Hindi | 4 | 0 | 0 | 8 | 4 | AE |
| 2 | ED1012E | Understanding India – II | 2 | 0 | 0 | 4 | 2 | AE |
| 3 | ED1013E | Teacher and Society | 2 | 0 | 0 | 4 | 2 | AE |
| 4 | ED1211E | Single Variable Calculus and Matrix theory | 3 | 1 | 0 | 8 | 4 | MM |
| 5 | ED1212E | Analytical Geometry and Number theory | 3 | 1 | 0 | 8 | 4 | MM |
| 6 | ED1114E | Chemistry Minor-II Physical Chemistry | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1314E | Physics Minor-II Thermal Physics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1411E | Botany Minor-II Biotechnology, Molecular Biology and Bioinformatics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1511E | Zoology Minor-II Animal Biotechnology | 3 | 1 | 0 | 8 | 4 | MM |
| | ED1611E | Economics Minor-II Microeconomics | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 20 | |

## Semester 3

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED2001E | Child Development and Educational Psychology | 4 | 0 | 0 | 8 | 4 | FE |
| 2 | ED2002E | General Pedagogy | 3 | 1 | 0 | 8 | 4 | CP |
| 3 | ED2201E | Real Analysis | 3 | 1 | 0 | 8 | 4 | MM |
| 4 | ED2202E | Multivariable Calculus and Vector Calculus | 3 | 1 | 0 | 8 | 4 | MM |
| 5 | ED2104E | Chemistry Minor-III Inorganic Chemistry | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2304E | Physics Minor-III Electromagnetism and Relativity | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2401E | Botany Minor-III Ecology and Environmental Science | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2501E | Zoology Minor-III Environmental Conservation and Sustainable Development | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2601E | Economics Minor III Indian Economy: Trends and Policies | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 20 | |

## Semester 4

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED2011E | Philosophical and Sociological Perspectives of Education-I | 4 | 0 | 0 | 8 | 4 | FE |
| 2 | ED2012E | Minor Pedagogy (Physical Science) | 3 | 1 | 0 | 8 | 4 | CP |
| | ED2014E | Minor Pedagogy (Biological Science) | 3 | 1 | 0 | 8 | 4 | CP |
| | ED2015E | Minor Pedagogy (Social Science) | 3 | 1 | 0 | 8 | 4 | CP |
| 3 | ED2211E | Differential Equations | 3 | 1 | 0 | 8 | 4 | MM |
| 4 | ED2212E | Modern Algebra | 3 | 1 | 0 | 8 | 4 | MM |
| 5 | ED2114E | Chemistry Minor-IV Organic Chemistry | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2314E | Physics Minor-IV Basic Electronics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2411E | Botany Minor-IV Structural Biology | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2511E | Zoology Minor-IV Bioinformatics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED2611E | Economics Minor IV- Money and Personal Finance | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 20 | |

## Semester 5

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED3001E | ICT in Education | 1 | 0 | 2 | 3 | 2 | AE |
| 2 | ED3004E | Major Pedagogy-I (Mathematics) | 3 | 1 | 0 | 8 | 4 | CP |
| 3 | ED3003E | Pre-internship Practice | 0 | 0 | 3 | 3 | 2 | SE |
| 4 | ED3201E | Linear Algebra | 3 | 1 | 0 | 8 | 4 | MM |
| 5 | ED3202E | Complex analysis and Numerical analysis | 3 | 1 | 0 | 8 | 4 | MM |
| 6 | ED3203E | Major Project | 0 | 0 | 0 | 12 | 4 | MM |
| | | Total | | | | | 20 | |

## Semester 6

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED3011E | Assessment and Evaluation | 2 | 0 | 0 | 4 | 2 | FE |
| 2 | ED3016E | Major Pedagogy-II (Mathematics) | 3 | 1 | 0 | 8 | 4 | CP |
| 3 | ED3013E | Inclusive Education | 2 | 0 | 0 | 4 | 2 | FE |
| 4 | ED3014E | Mathematical and Quantitative Reasoning | 1 | 1 | 0 | 4 | 2 | AE |
| 5 | ED3015E | School Observation | 0 | 0 | 0 | 6 | 2 | SE |
| 6 & 7 | ED3211E | Probability and Statistics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3212E | Metric spaces and Topology | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3213E | Fuzzy Set Theory and Applications | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3214E | Graph Theory and Combinatorics | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3215E | Introduction to Optimization | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3216E | Functional Analysis | 3 | 1 | 0 | 8 | 4 | MM |
| | ED3217E | Fluid Dynamics | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 20 | |

**Semester 7**

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED4001E | Perspectives on School Leadership and Management | 2 | 0 | 0 | 4 | 2 | FE |
| 2 | ED4002E | Curriculum Planning and Development | 2 | 0 | 0 | 4 | 2 | FE |
| 3 | ED4003E | Art Education- Performing and Visual | 1 | 0 | 2 | 3 | 2 | AE |
| 4 | ED4004E | Sports, Nutrition and Fitness | 1 | 0 | 2 | 3 | 2 | AE |
| 5 | ED4005E | School based Research Project | 0 | 0 | 0 | 6 | 2 | SE |
| 6 | ED4006E | Internship in Teaching | 0 | 0 | 0 | 30 | 10 | SE |
| 7 | ED4201E | Operations Research | 3 | 1 | 0 | 8 | 4 | MM |
| 8 | ED4202E | Advanced Real Analysis | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 28 | |

**Semester 8**

| Sl. No | Course Code | Title | L | T | P | O | C | Category |
|---|---|---|---|---|---|---|---|---|
| 1 | ED4011E | Philosophical and Sociological Perspectives of Education-II | 4 | 0 | 0 | 8 | 4 | FE |
| 2 | ED4012E | Education Policy Analysis | 2 | 0 | 0 | 4 | 2 | FE |
| 3 | ED4019E | Emerging Technologies in Education | 4 | 0 | 0 | 8 | 4 | FE |
| | ED4020E | Guidance and counselling | 4 | 0 | 0 | 8 | 4 | FE |
| 4 | ED4014E | Yoga and Understanding Self | 2 | 0 | 0 | 4 | 2 | AE |
| 5 | ED4015E | Citizenship Education, Sustainability and Environment Education | 2 | 0 | 0 | 4 | 2 | AE |
| 6 | ED4016E | Post-Internship (Review and Analysis) | 0 | 0 | 3 | 3 | 2 | SE |
| 7 | ED4017E | Teaching Learning Material/Work Experience | 0 | 0 | 3 | 3 | 2 | SE |
| 8 | ED4018E | Community Engagement and Service | 0 | 0 | 3 | 3 | 2 | CE |
| 9 | ED4203E | Topology | 3 | 1 | 0 | 8 | 4 | MM |
| 10 | ED4204E | Advanced Complex Analysis | 3 | 1 | 0 | 8 | 4 | MM |
| | | Total | | | | | 28 | |

**Semester-wise distribution of credits:**

| **Semester** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Credit** | 20 | 20 | 20 | 20 | 20 | 20 | 28 | 28 |

**ED4201E Operation Research**

| L | T | P | O | C |
|---|---|---|---|---|
| 3 | 1 | 0 | 8 | 4 |

Pre-requisites: Basic Linear Algebra and Calculus

Total Lecture Sessions: 39

**Course Outcomes:**

CO1: Model managerial problems in industries or civilian sectors into linear programming problems.
CO2: Find feasible solutions to linear programming problems using various techniques and algorithms.
CO3: Formulate and solve travelling salesman, transportation and assignment problems.
CO4: Manage large-scale projects using PERT/CPM.

Introduction to linear programming: Formulation of a linear programming problem through examples, Preliminary theory and geometry of linear programs, Lines and hyperplanes, Convex sets, Convex hull, Convex functions, Theorems dealing with vertices of feasible regions and optimality, Graphical solution, Basic feasible solution, Simplex method, Variants of simplex method (two-phase method and revised simplex method), Charne's method of penalty (Big-M method).

Computational complexity of simplex method, Interior point algorithms, Karmarkar's algorithm; Dual problem, Duality theory, Interpretation of dual variables, Dual simplex method, Primal-dual method, Sensitivity analysis, Bounded variable problem.

Integer linear programming: applications in real decision-making problems, Branch and bound algorithm, Cutting plane algorithm, Travelling salesman problem, Transportation problems, Integrity property, MODI method, Degeneracy, Unbalanced problem, Assignment problem, Development of Hungarian method, Routing problems.

Project management with PERT (program evaluation and review technique) and CPM (critical path method): Critical path analysis, Probability consideration in PERT, Distinction between PERT and CPM, Resources analysis in networking scheduling, Time cost optimization algorithm, Linear programming formulation, Introduction to optimization softwares.

**References:**


1. M. S. Bazaraa, J.J. Jarvis, and H.D. Sherali. Linear Programming and Network Flows, John Wiley & Sons. 4th Edition. 2011.
2. H. A. Taha. Operations Research: An Introduction. Prentice Hall, 10th Edition, 2017.
3. G. Hadley. Linear Programming. Narosa Publishing House, 1961.
4. F. S. Hillier, and G. J. Lieberman. Introduction to Operations Research. McGraw Hill Companies, Inc., 11th Edition, 2021.

## ED4202E Advanced Real Analysis

| L | T | P | O | C |
|---|---|---|---|---|
| 3 | 1 | 0 | 8 | 4 |

Pre-requisites: Basic Linear Algebra and Calculus

Total Lecture Sessions: 39

Course Outcomes:

CO1: Appreciate the role of least upper bound property in real analysis which underlies all crucial results.
CO2: Learn the crucial concept of continuity of functions and uniform continuity and will be able to work on problems emphasizing these ideas of real analysis.
CO3: Study thoroughly the metric topology and discuss the ideas connecting compactness and continuity and connectedness and continuity.
CO4: Inculcate interest in analysis and understand how pictures and leading questions get into the strategy of proofs.

Real number system and its structure, infimum, supremum, LUB Axiom, Countable and uncountable sets. Sequences and series of real numbers, subsequences, monotone sequences, limit inferior, limit superior, convergence of sequences and series, Cauchy criterion.

Functions of a single real variable, limits of functions, continuity of functions, uniform continuity, Differentiation, properties of derivatives, chain rule, Rolle's theorem, mean value theorems, L'Hopital's rule. Riemann Integration- Darboux Integrability- Properties of the Integral- Fundamental theorem of calculus.

Sequences and series of functions, pointwise and uniform convergence, Consequences of Uniform convergence- Series of functions- Power series- equicontinuity, pointwise and uniform boundedness, Arzela-Ascoli's theorem.

Metric spaces - Definition and examples - open balls and open sets- Convergent sequences in metric spaces - limit and cluster points, Cauchy sequences - Bounded sets - Dense sets- Compact spaces and their properties -Continuous functions on Compact spaces- Characterization of Compact Metric spaces - Connected spaces- Complete metric spaces - Examples- Baire Category Theorem - Banach Contraction Principle.

References:


1. R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis 4th Edn, Wiley India Edition, 2014.
2. S. Kumaresan, Topology of Metric Spaces, 2nd Edition, Narosa Publishing House, New Delhi, 2011.
3. Ajit Kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, Third Indian Reprint, 2015.
4. Edward D. Gaughan, Introduction to Analysis, AMS, Indian edition, 2010.
5. Kenneth A. Ross, Elementary Analysis: The Theory of Calculus, Springer Verlag, 2004.
6. Tom M. Apostol, Mathematical Analysis 2nd edn, Narosa, New Delhi, Reprint, 2002.
7. Walter Rudin, Principles of Mathematical Analysis, Third Edition, McGraw Hill, 2017.

**ED4203E Topology**

| L | T | P | O | C |
|---|---|---|---|---|
| 3 | 1 | 0 | 8 | 4 |

Pre-requisites: NIL
Total Lecture Sessions: 39

**Course Outcomes:**

CO1: Explain the fundamental structures of metric and topological spaces and the construction of subspace and product topologies.
CO2: Explain continuity and structural properties of topological spaces.
CO3: Analyze compactness, connectedness, and countability in general topological spaces.
CO4: Apply the fundamental theorems of topology to characterize topological structures and check the separation, metrizability and countability properties of topological spaces.

Review on Metric spaces, topological spaces, basis for a topology, closure, interior, boundary, limit points, dense sets, Baire category.

Continuous Functions and Structure: Continuous maps, bases and subbases, product topology, projections, separability, first/second countability, Hausdorff/regular/normal spaces, Uryshon's metrization theorem, Tietze's extension theorem.

Compact spaces, continuous images, locally compact spaces, connected and path-connected spaces, totally disconnected spaces, completeness, Tychonoff's theorem.

**References:**


1. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 1963.
2. J. R. Munkres, Topology: A First Course, Prentice-Hall, Englewood Cliffs, NJ, 1975.
3. S. Kumaresan, Topology of Metric Space, Alpha Science International, UK, 2005.
4. J. Dugundji, Topology, Allyn and Bacon, Inc., Boston-London-Sydney, 1978.
5. J. L. Kelley, General Topology, Graduate Texts in Mathematics, No. 27, Springer-Verlag, 1975.
6. S. Willard, General Topology, Reprint of the 1970 original (Addison-Wesley), Dover Publications, Mineola, NY, 2004.

## ED4204E Advanced Complex Analysis

| L | T | P | O | C |
|---|---|---|---|---|
| 3 | 1 | 0 | 8 | 4 |

Pre-requisites: NIL
Total Lecture Sessions: 39

Course Outcomes:

CO1: Understand Cauchy-Riemann equations, analytic functions, and various properties of analytic functions.
CO2: Find images of regions under the complex functions.
CO3: Apply the appropriate techniques of complex integration for establishing theoretical results and for solving related problems.
CO4: Use techniques of complex analysis to evaluate integrals of real-valued functions.
CO5: Represent functions as Taylor, power, and Laurent series, classify singularities and poles, find residues, and evaluate complex integrals using the residue theorem.

Geometry and topology of the complex plane, Riemann sphere, Limits, Continuity, Differentiability, Analytic functions, Cauchy-Riemann equation, Harmonic functions, Harmonic conjugate, Multi-valued functions, Mappings by elementary functions, Sequences and series, Uniform convergence, Radius of convergence of power series, power series as an analytic function, Complex exponential and Complex logarithm functions.

Elementary conformal mappings, Linear fractional transformations, Cross-ratio and its invariance property, Inverse Points, Mappings of disks and half-planes.
Complex integration, Arcs and closed curves, Line integral, Analytic functions in regions, Length and area, Cauchy's theorem, Index of a point with respect to a closed curve, Cauchy's integral formula, Morera's theorem, Weierstrass's convergence theorem.

Classification of singularities, Taylor's and Laurent's series (and theorems), Casorati-Weierstrass theorem, Cauchy's residue theorem, Evaluation of definite integrals. Zeros of analytic functions, Liouville's theorem, Fundamental theorem of algebra, Uniqueness theorem, Maximum modulus principle (and theorem), Schwarz lemma, Argument principle, Rouche's theorem, Open mapping theorem, Inverse function theorem.

**References:**


1. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, Second Edition, New Delhi, 2005.
2. S. Ponnusamy, H. Silverman, Complex Variables with Applications, Birkhäuser Boston, 2006.
3. L. V. Ahlfors, Complex Analysis, McGraw-Hill International Editions, Third Edition, New Delhi, 1979.
4. Dennis G. Zill and Patrick Shanahan, A first course in complex analysis with applications, Jones & Bartlett Learning, 2003
5. Conway J.B, Complex Analysis, Narosa Publishing House.1995