UNIVERSITY OF DELHI

CNC-II/093/1/EC-1275/25/14
Dated: 31.07.2025

NOTIFICATION

Sub: Amendment to Ordinance V

(ECR 07-7/ dated 23.05.2025)

Following addition be made to Annexure-II-A to the Ordinance V (2-A) of the Ordinances of the University;

Add the following:

The syllabus of M.Sc. Mathematics Education under the Cluster Innovation Centre based on Postgraduate Curriculum Framework 2024 is notified herewith for the information of all concerned as per ***Annexure-1.***

REGISTRAR

Annexure-1

UNIVERSITY OF DELHI

MASTER OF SCIENCE

(Mathematics Education)

Postgraduate Curricular Framework 2024 (PGCF)

(Effective from Academic Year 2025-26)

Cluster Innovation Centre

About the Program
M.Sc. Mathematics Education

Program Objectives

The M.Sc. (Mathematics) is an interdisciplinary program that would prepare students to be competent in various facets of mathematics education, including the nature of mathematics and associated disciplinary values, curriculum development, pedagogy, instructional resources (both hands-on and technology aided), Gen AI, and policy perspectives in an inclusive educational framework. The course will develop essential skill-set and competencies to address the issues in the field of mathematics education, and education at large, and to further explore innovations in mathematics education from multiple perspectives. The program aims to prepare mathematics educators who could address the current educational needs, and can contribute as future ready problem solvers, creative thinkers, and pedagogy innovators.

Program Learning Outcomes (PLO)

- Develop greater depth and breadth in mathematical domains most directly related to school and undergraduate mathematics;
- Understand mathematics education as an academic and research field learning about multiple facets of the field;
- Develop pedagogical competencies for inclusive classroom practices;
- Acquire skills to effectively use technology for enhancement of learning;
- Develop an understanding of curriculum frameworks writing meaningful course content;
- Develop creative learning resources using 'Hands-on' and 'Minds-on' approach;
- Apply design thinking protocols in preparing learning-teaching resources;
- Develop skills to analyse educational data and infer data driven informed decisions;
- Develop computational skills for need based solutions to educational challenges;
- Experience internship programs in schools and educational setting for real time learning;
- Develop an understanding of multi-disciplinary and inter-disciplinary approaches to mathematics learning;
- Develop an understanding of game design that can be used for learning mathematics.
- Develop an understanding of various research paradigms to conduct impactful educational research;
- Develop skills to disseminate learning to various stakeholders and to contribute meaningfully in educational and allied field.

The program course structure has a fine balance of foundation courses, elective courses and skill based courses. The course design is field intensive and provides opportunities for hand-on experiences through internships, projects, practical/practicum and research.

1st Year of PG Curricular Structure for Two-Year PG Programme (3+2)

Semester I					
Discipline Specific Core (DSC) Courses					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
I.1 DSC 1	Calculus and Ordinary Differential Equations	03	00	01	04
I.2 DSC 2	Foundations of Education: Philosophical, Psychological and Social Threads	03	01	00	04
I.3 DSC 3	Mathematics Education: Perspectives and Emerging Trends	03	01	00	04
Discipline Specific Elective (DSE) & General Elective (GE) Courses					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
DSE (I.4.1-I.4.4)	**I.4.1** Innovation in Education	02	00	02	04
	I.4.2 Contemporary Issues in Education	03	01	00	04
	I.4.3 Mathematics for All: Inclusive Learning Spaces	03	00	01	04
	I.4.4 Educational Leadership and Management	03	01	00	04
I.5 GE	**I.5.1** Foundations of Research Methodology	03	01	00	04
	I.5.2 Human Cognition and Learning				
Skill Based Course (SBC)					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
I.6 SBC (1) (any one) It will be a School Pre-Immersion Program)	**I.6.1** Foundational Literacy & Numeracy	01	00	01	02
	I.6.2 Classroom Management				
	I.6.3 Hands-on Mathematics Learning Resources				

Dissertation/Academic Project/Entrepreneurship: Nil
Total Credits in Semester I: 22

Note
• The student will study:
  • All Discipline Specific Core courses;
  • Any two Discipline Specific Electives (DSE) from (I.4.1 to I.4.4);
  or
  One DSE from (I.4.1 to I.4.4) and One GE from (I.5.1-I.5.2);
  • The student can take one Skill Based Course (SBC (1)) out of the three given options (I.6.1-I.6.3).

Discipline Specific Core (DSC): 04 Credits

DSC 1 (I.1) Calculus and Ordinary Differential Equations
Discipline Specific Core

1. Credit Distribution of the course

Course title & Code DSC 1 (I.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Calculus and Ordinary Differential Equations	4	3	0	1	Undergraduate	Mathematics in Class XII

2. Learning Objectives

The paper builds up on the topics, namely limits and continuity, differentiation and integration, and based on these concepts, they will develop ordinary differential equations models. The methodology involves first analyzing and understanding the real-life problems, solving them, and then analyzing the solution. Students will use MATHEMATICA software for the purpose of simulation.

3. Learning Outcomes

After completing this course, students should be able to:

- explain the fundamental concepts of calculus and ordinary differential equations (ODEs);
- use MATHEMATICA software to solve problems and applications of calculus and ordinary differential equations;
- formulate real-life problems based on concepts of Calculus and ordinary differential equations.

4. Syllabus

Unit I: Understanding of the ideas of limits and continuity graphically, calculating limits at infinity, indeterminate forms, special limits involving exponential and logarithmic functions, and asymptotes; algebraic manipulation, graphing of quadric surfaces; Comparing the graphs of a function, its first derivative and its second derivative, sketching curves, solving optimization problems, differentiation, concavity, how derivatives and its effect on the shape of the graph. **[12 hours]**

Unit II: Integration as a limit of a sum, volume of a 3D shape. Finite volume but infinite surface area, parametric equations of curves, arc length, and surface area. Understanding the ideas of sequences and infinite series, including Taylor approximations. **[9 hours]**

Unit III: First order differential equations - Variable separable, homogeneous, linear, exact differential equation - Integrating factors. Application of first-order differential equation to draining a tank, harvesting renewable natural resources, indoor temperature oscillation, etc. **[12 hours]**

Unit IV: General solutions of second-order differential equation - Homogeneous and non-homogeneous differential equations with constant coefficients - Method of variation of parameters - Method of undetermined coefficients. System of linear differential equations applied to mechanical systems, electrical networks, and solutions of a linear system. **[12 hours]**

5. Practical Details – The following explorations would be carried out on *Mathematica* software: [30 hours]

- Plotting of slope fields and solution curves of first-order and second-order differential Equations.
- Graphical analysis of the solution of Population model, Pollution Model, Acceleration Velocity Models.
- Graphical illustration of limits of the functions.
- Plotting of the graphs of the functions and their derivatives.
- Create a project using fundamental knowledge and principles that help to provide a hands-on experience.

6. Essential Readings

- Thomas G. B. & Finney, R.L. (1998). *Calculus and Analytic Geometry*, Addison-Wesley.
- Thomas G.B., Weir M.D., Hass J. & Hell C. (2014). *Calculus*, 13th Edition, Pearson.
- Edwards C.H. & Penny D.E. (2005). *Differential equations and boundary value problems: Computing and modeling*, Pearson Education (Singapore).

7. Suggestive Readings

- Cohen, D; Henle, J. M. and Cohen, W. D. (2005) Calculus: The Language of Change, Jones and Bartlett Publishers, Inc.
- Callahan, J.; Cox, D and Hoffman, K. (1995) Calculus in Context: The Five College Calculus Course, W.H. Freeman & Co. Ltd.
- Krantz, S.G (2015) How to Teach Mathematics, American Mathematical Society.

DSC 2 (I.2) Foundations of Education: Philosophical, Psychological and Social Threads
Discipline Specific Core

1. Credit Distribution of the course

Course title & Code DSC 2 (I.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Foundations of Education: Philosophical, Psychological and Social Threads	**4**	**3**	**1**	**0**	**Undergraduate**	**No specific requirement**

2. Learning Objectives

The course explores the foundations of education at the intersection of philosophical, psychological, and social dimension, presenting a comprehensive overview of theoretical underpinnings. It examines major philosophical perspectives, including Indian and Western thinkers, and their influence on educational discourse. Students will analyze key psychological theories of learning and learners. The course acquaints learners with key concepts and theories of sociology of education, addressing issues of inclusion, diversity and the role of education in shaping the education landscape. It prepares learners to critically evaluates the impact of social institutions, policies, and governance on education systems with a special emphasis is National Education Policy (NEP) 2020.

3. Learning Outcomes

- Explain and interlink major philosophical and sociological foundations of education;
- Analyze key concepts in psychology and their relevance in education;
- Examine contemporary educational challenges specific to Indian and global context;
- Develop an informed perspective on inclusive, sustainable and future education.

4. Syllabus

Unit I Philosophical Foundations of Education - Epistemological bases and their interpretation in Philosophy of Education: Ways of philosophical inquiry, knowledge as meaning making, knowledge as many 'arts', Traditional philosophical debates and synergies in

education w.r.t. Indian and Western educational thinkers (*Western: Socrates, Plato, Aristotle, Rousseau, Froebel, Pestalozzi and Dewey; Indian: Indian knowledge system, Gandhi, Tagore, Krishnamurthy, Aurobindo*) **[12 hours]**

Unit II Sociological Foundations of Education - Relation between society, education and social change; sociology of education; education as a social institution. Classical and contemporary social theories in education (*Indian and Western Perspectives: Durkheim's theory of Structure Functionalism; Paulo Freire's Pedagogy of the Oppressed; Scholarship of Govind Sadashiv Ghurye: Blending of Sociology and Indology; Mysore Narasimhachar Srinivas's idea of Westernization and Sanskritization)* **[12 hours]**

Unit III Psychological Foundations of Education - Psychology of human development: Concepts and principles of development; key aspects of child development (physical, cognitive and psycho-social), individual differences, Psychology and education: Relation between education and psychology, psychology of education as an interdisciplinary approach, scope and major research trends. **[12 hours]**

Unit IV Emerging Trends in Education - Education for sustainability and global citizenship, education as a means of competitive economy vs education for peace, education in the digital era, National Education Policy 2020: Vision and implementation challenges. **[9 hours]**

5. Tutorial Details

1. Create an intersectional diagrammatic representation linking philosophical, psychological, and social theories in shaping the modern educational policies with special reference to NEP 2020.

2. Create a digital timeline showing the evolution of educational thought, highlighting key thinkers, ideas, and their relevance today. (choose either Indian or western thinkers).

3. Write a reflective journal highlighting the role of your family, community & peer group influencing your educational choices. (Max word limit up to 2000 words).

6. Essential Readings

- Dewey J. (1916). *Democracy and Education.* Macmillan.
- Noddings N. (2013). *Philosophy of Education.* Westview Press.
- Krishnamurti J. (1953). *Education and the Significance of Life.* Harper & Row.
- Bourdieu P. & Passeron, J. (1977). *Reproduction in Education, Society and Culture.* Sage.
- Apple M.W. (2004). *Ideology and Curriculum.* Routledge.

7. Suggestive Readings

- Vygotsky L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Harvard University Press.
- Piaget J. (1952). *The Origins of Intelligence in Children.* International Universities Press.

- Ministry of Education, National Education Policy-2020, Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Jason C.R. (2015) Foundations of Education: A Social, Political, and Philosophical Approach. Canadian Scholars' Press.
- Winston C.T. (ed.) (2023). Philosophical foundations of education. New York: Bloomsbury Academic.

DSC 3 (I.3) Mathematics Education: Perspectives and Emerging Trends
Discipline Specific Core

1. Credit Distribution of the Course

Course title & Code DSC 3 (I.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematics Education: Perspectives and Emerging Trends	**4**	**3**	**1**	**0**	**Undergraduate**	Mathematics in class XII

2. Learning Objectives

The course examines the philosophical, historical, and socio-cultural perspectives of mathematics education. The course presents mathematics education as an academic and research field. It allows learners to explore the pertinent gaps between disciplinary nature of mathematics and teaching of mathematics. Learners will engage with emerging trends in mathematics education and its integration with NEP 2020.

3. Learning Outcomes

- to understand the foundations of nature of Mathematics;
- to understand the philosophical, historical and sociological facets of mathematics education;
- to explain the constructs of language of mathematics;
- to critically examine the emerging trends in school math education w.r.t NEP 2020.

4. Syllabus

Unit I Nature, Philosophy and Foundation of Mathematics - Nature of mathematics and mathematical ideas, philosophy of mathematics and mathematics education, mathematics education in social and cultural context, mathematics as an intellectual property vs mathematics as a humanistic discipline. **[12 hours]**

Unit II History of Mathematics - History of Mathematics in and for the curriculum, mathematics as an intellectual property vs mathematics as a humanistic discipline, mathematics in popular culture. **[9 hours]**

Unit III Language of Mathematics - Mathematics and symbolization, language of mathematics and language in mathematics, knowing in mathematics. **[9 hours]**

Unit IV Emerging trends in School Mathematics - Issues of equality and excellence in school mathematics, Gender stereotypes in Mathematics, Mathematics for future vs Mathematics for appreciation, principles and Standards for school Mathematics, Mathematics literacy and Mathematics for all. **[15 hours]**

5. Tutorial Details

1. Book review *(any one)*
   - A Mathematician's Apology by G.H. Hardy The Mathematical Experience by Philip J.
   - Davis & Reuben Hersh, Cambridge University Press (2004).
   - Does God Play Dice? by Ian Stewart, Blackwell Publishing (1989).
   - The Man Who Knew Infinity by Robert Kanigel, Little Brown Book Group (1992).
2. Open house discussion on contemporary issues in school mathematics
3. History of mathematics time line (specific time period)

6. Essential Readings

- Boaler J. (2015). *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages, and Innovative Teaching*. Jossey-Bass.
- Eves H. (1990). *An Introduction to the History of Mathematics*, Third Edition, Cengage Learning.
- The Foundations of Mathematics by Ian Stewart and David Tall, Oxford University Press (1977).

7. Suggestive Readings

- Devlin K. (1997). *Mathematics: The Science of Patterns,* Scientific American Library.
- NCERT, National Curriculum Framework 2005. https://ncert.nic.in/pdf/focus-group/math.pdf
- NCERT, NCF-SE-2023. https://ncert.nic.in/pdf/NCFSE-2023-August_2023.pdf
- The Calculus Gallery, Masterpieces from Newton to Lebesgue by William Dunham (Princeton University Press) (2008).
- Ernest P. (1991). *The Philosophy of Mathematics Education*. Falmer Press.

Discipline Specific Electives (DSE): 04 Credits

DSE (I.4.1) Innovations in Education
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (I.4.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Innovations in Education	4	2	0	2	Undergraduate	-

2. Learning Objectives

Innovation in Education is important to solve many contemporary challenges faced by the country today. The course aims to develop an insight into the process of developing innovative ideas; how to deconstruct standardized procedures and think more open, creative and out of box ideas to target realistic problems of education.

3. Learning Outcomes

- able to conceptualize the idea of innovation;
- able to identify factors responsible for innovation;
- able to understand the need and scope of innovation in educational practices.

4. Syllabus

Unit I Understanding concept of Innovation - Conceptualizing innovation in in terms of: Learning; Teaching; Society; Industry. **[7 hours]**

Unit II: Essentials of Innovation: Innovation as an idea, product or process; innovation and need of society; innovation and technology. **[7 hours]**

Unit III: Creating an environment for Innovation - Factors responsible for innovation; Need identification and working for innovation; support system to promote innovation; Implementing changes for promoting innovation; innovation by practice. **[9 hours]**

Unit IV: Innovations in Education: Educational needs, curriculum and practices, hands on - minds on. **[7 hours]**

5. Illustrative Practical Details **[60 hours]**

- To exploring and applying "4Cs" essentials of Innovation that make up Learning and Innovation Skill to field of education.
- To study the distinction between the terms: Innovation, Reforms and Changes with examples.
- To identify four types of innovations in terms of education and developing sample modules
- To explore linkage of education to entrepreneurship with workable modules
- To explore role of internet in fostering innovation in education
- To prepare modules of innovative teaching practices to enhance learning
- To explore innovations in educational sectors
- To explore factors responsible for making innovations in education sector a success.
- To learn to fostering a culture of innovation in educational institutes
- To study support system to promote innovation in educational institutions.
- To study aspects to design an innovative classroom
- To study life story of innovators.
- To explore innovative methods of teaching mathematical concepts in Vedic maths.

6. Essential Readings

- Scott D. & Mota R. (2014). *Education for Innovation and Independent Learning*, Elsevier.
- Wagner T. (2012). *Creating Innovators: The Making of Young People Who Will Change the World*, Schuster.

7. Suggestive Readings

- Casas, Whitaker,. & Zoul. (Ed.).(2019). *10 Perspectives on Innovation in Education (Routledge Great Educators Series* (Vol.I). Routlegde.
- Plucker J.A. (2021). *Creativity and Innovation: Theory, Research, and Practice* Prufrock Press.

DSE (I.4.2) Contemporary Issues in Education
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (I.4.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Contemporary Issues in Education	4	3	1	0	Undergraduate	-

2. Learning Objectives

The course aims to engage learners in exploring the evolving landscape of education, particularly focusing on the contemporary trends and the impact of socio-political/technological developments.

3. Learning Outcomes

- Explore and critically analyse current trends, issues, and challenges in education.
- Examine the impact of socio-political, economic, and technological changes on education.
- Develop an understanding of policies and reforms shaping modern Indian education.
- Foster reflective thinking and research on contemporary educational issues.

4. Syllabus

Unit I Education in the 21st century - Concept of Contemporary Education: Meaning, Scope, and Significance; Global perspective of Education: Role international bodies in educational development: (UNDP, WHO, UNICEF, UNESCO, World Bank) with reference to India; Sustainable Development Goals (SDGs) and Education. **[12 hours]**

Unit II Educational challenges from a socio-cultural perspective - Equity, Access, and Inclusion: Education for Marginalized Groups; Gender and Education: Issues of Gender Disparity, Feminist Pedagogy; Multiculturalism and Diversity in Education; Value Education and Ethics in Contemporary Society. **[12 hours]**

Unit III Policy Reforms and Practices - National Education Policy (NEP) 2020 and its Implementation; Curriculum Reforms and Pedagogical Innovations; Education for Skill Development and Employability; Political Influence on Educational Policies. **[9 hours]**

Unit IV Current Trends and Opportunities for Future Education - Technological Interventions in Education: Contribution of science and technology to education and challenges ahead; Privatization and Commercialization of Education; Education for skill Development, employability and opportunities. **[12 hours]**

5. Tutorial Details

1. Create a detailed concept map showing the interconnections among contemporary issues, Can be done digitally (e.g., using Coggle or Canva) or manually. This will focus on systematic thinking and synthesis of complex ideas.

2. Conduct a short literature review of 05-06 research articles on any one contemporary educational issue.

3. Create an Education News Log by collecting news articles/editorials from any one newspaper of your choice. Collect the articles for at least a period of one month. Write a critical reflection linking each news item to theoretical frameworks or policies studied in the course.

6. Essential Readings

- Aggarwal J.C. (2020). *Contemporary Issues in Education,* Vikas Publishing House.
- Rao D.B. (2018). *Globalization and Education,* APH Publishing.
- Kumar K. (2021). *Education and Social Change in India,* Orient Black Swan.
- Sharma R. & Sharma V. (2019). *Teacher Education: Challenges and Perspectives*. Sage Publications.
- Ministry of Education, National Education Policy-2020, Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

7. Suggestive Readings

- Mohanty, J. (2010). *Contemporary issues in education*. Dorling Kindersley India.
- Paulo F. (ed) (2005). Pedagogy of the Oppressed. Continuum, New York, London.
- Henry A.G. (2024). Theory and Resistance in Education, Bloomsbury Publishing.
- Pathak, R. P. (2014). *Contemporary India and education*. Pearson Education India.

DSE (I.4.3) Mathematics for all: Inclusive learning spaces
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (I.4.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematics for all: Inclusive learning spaces	4	3	0	1	Undergraduate	-

2. Learning Objectives

The course aims to enable students to use/develop need based pedagogical strategies and teaching learning resources for an inclusive classroom. It will focus on learning needs of differently abled learners.

3. Learning Outcomes

- able to understand meaning of diverse ability learners;
- conceptualize framework of an inclusive classroom;
- able to learn strategies of differentiation in an inclusive classroom;
- able to develop need-based resources for differently abled learners, including double exceptional.

4. Syllabus

Unit I Theoretical constructs of Inclusive Mathematics Education for All - Diversity in Mathematics classroom, Mathematics for all, Accessible curriculum, Universal design of learning in mathematics. **[12 hours]**

Unit II Fundamentals of pedagogical intervention - Pedagogical intervention as a process, Pedagogical intervention vs Instructional strategy, Pedagogical intervention vs Accommodation, Challenges of diverse learners (SEN, Dyscalculia, Gifted, Socio-economic marginalized disparities, Twice-exceptional). **[12 hours]**

Unit III Strategies for pedagogical interventions - Differentiation concept and principles strategic grouping and peer collaborations, Culturally-responsive pedagogy, Mathematical anxiety and growing mind set. **[12 hours]**

Unit IV Bridging the achievement gap - Need based leaching resources using visual, tactile; auditory; kinematic, Curriculum for advanced learner using acceleration and enrichment.

[9 hours]

5. Illustrative Practicum Details **[30 hours]**

- Diagnostic assessment for learning difficulties in mathematics;
- Error pattern analysis;
- Misconception identification tool design;
- Grade specific context based mathematics module design;
- Learning tools for differently abled learners.

6. Essential/recommended readings

- Riccomini P.J. (2009). *Response to Intervention in Mathematics,* Corwin Publisher.
- Hudson P.P. & Miller P.S. (2005). *Designing and Implementing Mathematics Instruction,* Pearson, 2005.
- Alisopp D., Kyger M. & Lovin L.H. (2007). *Teaching Mathematics Meaningfully: Solution for reaching struggling learners*. Brookers Publishing.

7. Suggestive Readings

- Boaler J. & Dweck C. (2015). *Mathematical Mindsets: Unleashing Students' Potential through Creative Mathematics, Inspiring Messages and Innovative Teaching,* Jossey-Bass Publishers.
- NCTM. (2014). *Principles to Actions: Ensuring Mathematical Success for All.*
- Chinn S. (2017). *The Routledge International Handbook of Dyscalculia and Mathematics Learning*. Routledge Publishers.

DSE (I.4.4) Educational Leadership and Management
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (I.4.4)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Educational Leadership and Management	4	3	1	0	Undergraduate	-

2. Learning Objectives

This course explains the theoretical and structural dimensions of educational leadership and management, equipping learners with understanding to effective leadership in educational institutions. It elaborates the models of educational management and leadership. Learners will understand the practices of effective governance through decision making and team building fostering the culture of excellence in educational settings.

3. Learning Outcomes

- explain the roles, functions and types of educational institutes;
- understand the principles of leadership and management in educational settings;
- analyse different models of educational leadership and management;
- demonstrate skills in communication, conflict resolution, and team management;
- examine various case studies to understand governance structures and regulatory framework affecting educational leadership.

4. Syllabus

Unit I Leadership in Educational Institutes - Concept , Nature and Characteristics of Educational Institutes, Roles and functions of educational institutes, Types of educational institutes, Accreditation of educational institutes. **[10 hours]**

Unit II Understanding Leadership and Management in Educational Institutes - Meaning and scope of educational leadership and management, Relation between educational leadership and management, Models of educational leadership (Managerial, Transformational, Transactional, Post- Instructional), Educational management models (Formal, Collegial, Subjective, Ambiguity) **[12 hours]**

Unit III Governance in Educational Institutes - Roles of school management/principals, administrators, Financial planning & Resource Management , Ethical Issues and practices, Legal provisions, implications and safeguards. **[11 hours]**

Unit IV Strategic Leadership and Management in Education - Conflict resolutions and decision making, Leadership for innovation and social change, Creating a positive learning ecosystem, NEP 2020 recommendations for educational leadership and governance.**[12 hours]**

5. Tutorial Details

1. Write a short essay (up to 1000 word) reflective yourself in a leadership role and how your leadership style helped in decision making.

2. Conduct an interview with a school principal/school head to know how they align their leadership practices with national educational policies. Transcribe the interview and prepare an analytical report.

6. Essential Readings

- Bush T. (2018). *Theories of Educational Leadership and Management* (5th ed.). Sage Publications.
- Leithwood K., Sun J. & Pollock K. (2017). *How School Leaders Contribute to Student Success: The Four Paths Framework.* Springer.
- Dimmock C. (2011). *Leadership, Capacity Building and School Improvement: Concepts, Themes and Impact.* Routledge.

7. Suggestive Readings

- Fullan, M. (2014). *The principal: Three keys to maximizing impact.* Jossey-Bass.
- Earley, P., & Greany, T. (2017). *School leadership and education system reform.* Bloomsbury Academic.
- Harris, A. (2009). *Distributed leadership: Different perspectives.* Springer.

General Elective (GE): 04 Credits

GE (I.5.1) Foundations of Research Methodology
General Elective

1. Credit Distribution of the Course

Course title & Code GE (I.5.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Foundations of Research Methodology	4	3	1	0	Undergraduate	-

2. Learning Objectives

The paper focuses on idea of research in education and various research designs highlighting the quantitative and qualitative methods of data collection and data analysis. It also sensitizes students into the challenges of carrying out research in the field of education. Students are expected to do micro research project in educational setting to connect theory into practices.

3. Learning Outcomes

- elaborate the role of research as a systematic inquiry;
- explain qualitative and quantitative research paradigms and their applications;
- understand the need, types and process of literature review;
- analyse various research designs and methodologies;
- design appropriate research tools and techniques ensuring reliability, validity, and objectivity;
- develop research plan, hypothesis formulation, tool development, data collection, and analysis;
- design and present a research proposal applying theoretical knowledge to practical research challenges.

4. Syllabus

Unit I: Introduction to Educational Research - Research as source of inquiry, role of research in the field education, qualitative and quantitative paradigms of research, Types of research (experimental, descriptive and action research); Role of theory in research. **[12 hours]**

Unit II: Research Paradigms and Design - Research design in educational research, sampling and techniques in data collection and data analysis, objectivity, reliability, validity and statistical inferences. **[12 hours]**

Unit III: Understanding Research Processes - Steps in carrying out research, research planning, writing proposal, review of literature, hypothesis, tools design, data collection and analysis, report writing. **[12 hours]**

Unit IV: Learning to write research proposal - Writing and defending a research proposal/ Micro research project. **[9 hours]**

5. Tutorial Details - Design Your Own Mini Research Project: Students are expected to do micro research project in educational setting to connect educational theory into practices.

6. Essential Readings

- Best J. & Kahn J. (2012). *Research in Education,* PHI learning Private Limited.
- Reason P. & Bradbury H. (Eds.) (2006). *Handbook of Action Research.* Thousand Oaks, CA: Sage.
- Cohen L., Manion L. & Morrison K. (2003). *Research Methods in Education*, Taylor & Francis
- Fraenkel J.R., Wallen N.E. (1996). *How to Design and Evaluate Research in Education,* New York: McGraw Hill.

7. Suggestive Readings

- Stake R. E. (1995). *The Art of Case Study Research,* Sage.
- Christensen L. (2007). *Experimental Methodology,* Boston: Allyn & Bacon.
- Borg W.R. & Gall M.D. (1983). *Educational Research – An Introduction*, New York: Longman, Inc.
- Sharma S.R. (2003). Problems of Educational Research. New Delhi: Anmol Publication.
- Opie C. (2004). *Doing Educational Research- A Guide for First time researchers.* New Delhi: Vistar Publications.

GE (I.5.2) Human Cognition and Learning
General Elective

1. Credit Distribution of the Course

Course title & Code GE (I.5.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Human Cognition and Learning	4	3	1	0	Undergraduate	-

2. Learning Objectives

The course aims to develop understanding of human cognition and relevance of psychological perspective of learning; Learners will get acquainted with the approaches and process of learning in children; The course will help learners understand the dynamics of learning and apply the learning principles in classroom situations.

3. Learning Outcomes

- Explain the nature and meaning of learning and its implications for education;
- Examine and compare different psychological approaches to learning, including behaviouristic, cognitive, and humanistic perspectives;
- Analyse key learning theories in relation to educational settings;
- Understand the principles of constructivism, including its meaning, scope, and role in shaping effective teaching-learning experiences.

4. Syllabus

Unit I Foundations of Human Cognition: Definition and scope of human cognition; cognitive architecture: working memory, long-term memory, and information processing; perception, attention, and consciousness in learning. **[12 hours]**

Unit II Psychology of Learning - Learner and Learning - Nature, meaning and scope; Behaviouristic, Cognitive and Humanistic approaches of learning. **[10 hours]**

Unit III Theories of Learning - Pavlov's, Skinner's and Gestalt theories of learning; The Social Cognitive Theory with special reference to Bandura, Dollard and Miller; Transformative Learning Theory with special reference to Jack Mezirow; Social Development theory

(Vygotsky), Discovery Learning; Experiential Learning theory (Kolb); Cognitivist Learning Theories: Attribution theory (Weiner), Metacognition (Flavell); E-Learning Theory, The Information Processing Theory (with special reference to Ausubel and Bruner).**[15 hours]**

Unit IV Constructivism and Learning - Meaning and scope of constructivism; learning styles and their relevance to learning. **[8 hours]**

5. Tutorial Details

1. Make an infographic poster representing any one learning theory highlighting its features and limitations.
2. Prepare a case study of any math learning issue and choose a suitable learning theory to overcome the challenge.
3. Design a classroom activity using a learning theory of your choice.

6. Essential Readings

- Olson M.H. & Hergenhann (2013).*Theories of Learning,*PHI Learning Pvt. Ltd.
- Schunk H.D. 2014). *Learning Theories: An Educational Perspective*. Harlow, England, Pearson Publisher.
- Bates B. (2016). *Learning Theories Simplified and how to apply them to teaching,* Sage Publication.

7. Suggestive Reading

- Ormrod, J. E. (2020). *Human learning* (8th ed.). Pearson.
- Schunk, D. H. (2020). *Learning theories: An educational perspective* (8th ed.). Pearson.
- Illeris, K. (2018). *Contemporary theories of learning: Learning theorists in their own words* (2nd ed.). Routledge.

Skill Based Course (SBC): 02 Credits

SBC (1) (I.6.1) Foundational Literacy and Numeracy
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (1) (I.6.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Foundational Literacy and Numeracy	2	1	0	1	Undergr aduate	-

2. Learning Objectives

The course provides a comprehensive understanding of foundational literacy and numeracy and its critical role in future learning. It explores the cognitive processes involved in pre-number concepts, helping learners analyze how young children develop literacy and numeracy abilities in classroom context and outside the formal learning system.

3. Learning Outcomes

- Explain pre-number concepts as key concepts in early numeracy development;
- Examine the cognitive processes involved in developing number sense and numeracy skills;
- Engage with the cognitive skills for language development and its role in literacy acquisition;
- Integrate foundational numeracy and literacy concepts into more advanced concepts.

4. Syllabus

Unit I Key concepts in Foundational Numeracy - Pre-number concepts; Number and Cognitive Process; Working of number system; Developing number concept in young learners. **[8 hours]**

Unit II Key concepts in Foundational Literacy - Language and Literacy; Construct of language; Determinants of literacy; Developing literacy in young learners. **[7 hours]**

5. Practicum Details: School Pre-Immersion Program - School visit to study the foundational numeracy and literacy development process among children as School Pre-Immersion Program. **[30 hours]**

6. Essential Readings

- Reys, R. E., Lindquist, M. M., Lambdin, D. V., & Smith, N. L. (2014). *Helping children learn mathematics* (11th ed.). Wiley.
- Anghileri, J. (2006). *Teaching number sense* (2nd ed.). Continuum.
- NCERT (2023). Jaadui Pitara.

7. Suggestive Reading

- Haylock, D., & Cockburn, A. (2017). *Understanding mathematics for young children: A guide for foundation stage and lower primary teachers* (5th ed.). Sage Publications.
- Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). Routledge.

SBC (1) (I.6.2) Classroom Management
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (1) (I.6.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Classroom Management	2	1	0	1	Undergr aduate	-

2. Learning Objectives

The course develops an understanding of classroom management strategies based on NEP 2020 principles. It equips students with skills for creating an inclusive and engaging learning environment and prepares learners to address contemporary challenges in classroom management and student behavior.

3. Learning Outcomes

- Explain the fundamentals of classroom management principles and strategies;
- Critically examine the meaning and need of an inclusive and engaging learning environment.
- Enable students to integrate classroom management strategies in real classrooms.
- Address contemporary challenges in classroom management and student behaviour.

4. Syllabus

Unit I Fundamentals of Classroom Management - Concept, Need, and Importance of Classroom Management; Classroom Management Approaches: Behaviourist, Constructivist, and Humanistic Approaches; trategies for building a Positive Classroom Culture and Student-Teacher Relationships; Diversity in the Classroom: Addressing Socio-Economic, Cultural, and Learning Differences. **[8 hours]**

Unit II Behavioural Management and Conflict Resolution - Understanding Student Behaviour: Strategies for Handling Disruptive Behaviours; Positive Discipline Approaches (Restorative Practices, Mindfulness, and Positive Reinforcement); Bullying and Peer Conflicts: Prevention and Intervention Strategies. **[7 hours]**

5. Practicum Details: School Pre-Immersion Program - Observation and analysis of real classroom settings linking socio-cultural and psychological theories of learners' behaviour and classroom culture (as part of the School Pre- Immersion Program). **[30 hours]**

6. Essential Readings

- Charles C. M. (2019). *Building Classroom Discipline.* Pearson Education.
- Marzano R.J. (2017). *Classroom Management That Works: Research-Based Strategies for Every Teacher.* ASCD.
- Evertson C.M. & Weinstein C.S. (2020). *Handbook of Classroom Management: Research, Practice, and Contemporary Issues.* Routledge.

7. Suggestive Readings

- Evertson C.M. & Weinstein C.S. (2020). *Handbook of Classroom Management: Research, Practice, and Contemporary Issues.* Routledge.
- Emmer, E. T., & Evertson, C. M. (2016). *Classroom management for middle and high school teachers* (10th ed.). Pearson.

SBC (1) (I.6.3) Hands-on Mathematics Learning
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (1) (I.6.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Hands-on Mathematics Learning	2	1	0	1	Undergraduate	-

2. Learning Objectives

This course emphasizes the importance of experiential and interactive learning methods that engage students in active problem-solving and conceptual understanding. It presents an overview of hands-on learning approaches in mathematics learning and how to create creative and engaging hands-on math learning resources.

3. Learning Outcomes

- explain the principles of 'hands-on' and 'mind-on' approaches to mathematics learning;
- explore the role of manipulatives and tangible tools/models in strengthening mathematical learning;
- design and field test puzzles, games, and storyboards using low cost local resources;
- use popular resources as Geoboards, Dienes' blocks, and Escher's tiles to support mathematical concepts.

4. Syllabus

Unit I Key Principles of Hands-on learning - Hands-on & Mind-on approach in mathematics; Importance of Manipulatives & Visual Models; Mathematics through Play, Puzzles, Games & Storytelling. **[7 hours]**

Unit II Interactive Hands-on Mathematics learning resources - Characteristics of learner centric resources; Using Manipulatives in math classroom: (popular manipulatives Geoboards, Dienes' blocks, Esher's tiles etc); Locally drawn and low cost manipulatives. **[8 hours]**

5. Practicum: School Pre-Immersion Program **[30 hours]**

- Designing and field testing mathematical board games and field test;
- Designing and field testing a story board

- Mathematical puzzles
- Organizing math fair in school
- Develop interactive hands-on mathematics learning tool and use it as a learning-teaching resource in a math classroom. (as part of the School Pre- Immersion Program).

6. Essential Readings

- Carey B. (2015). *How We Learn,* Random House Inc.
- Gardner M. (2003). *Mathematics, Magic and Mystery,* Dover Publications Inc.
- Marzano R.J. (2017). *Classroom Management That Works: Research-Based Strategies for Every Teacher.* ASCD.

7. Suggestive Readings

- Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and middle school mathematics: Teaching developmentally* (10th ed.). Pearson.
- Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages, and innovative teaching*. Jossey-Bass.

Semester II					
Discipline Specific Core (DSC) Courses					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
II.1 DSC 4	Discretizing and Understanding Real Life Situations Through a Mathematical Lens	03	00	01	04
II.2 DSC 5	Arts of Teaching Mathematics	03	00	01	04
II.3 DSC 6	Curriculum: Nature, Theories and Models	03	00	01	04
Discipline Specific Elective (DSE) & General Elective (GE) Courses					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
II.4 DSE	**II.4.1** Digital Technology in Education	02	00	02	04
	II.4.2 Education for Sustainable Future	03	01	00	04
	II.4.3 Research Investigations in Mathematics Education	03	01	00	04
	II.4.4 Insights into Educational Data	03	00	01	04
II.5 GE	**II.5.1** Gamification and Design Thinking	03	00	01	04
	II.5.2 Entrepreneurship for Social Change	03	01	00	04
Skill Based Course (SBC)					
Paper No.	**Interactive Learning Modules (Paper Title)**	**Lecture**	**Tutorial**	**Practical**	**Credits**
II.6 SBC (2)	**II.6.1** Academic Writing and Ethical Practices	01	00	01	02
	II.6.2 Social-Media for Educational Communication				
	II.6.3 Learning Ways of Mathematical Writing				
Dissertation/Academic Project/Entrepreneurship: Nil					

Total Credits in Semester II: 22

Note

- The student will study
  - All Discipline Specific Core courses;
  - Any two Discipline Specific Electives (DSE) from (II.4.1 to II.4.4)
    or
    One DSE from (II.4.1 to II.4.4) and One GE from (II.5.1-II.5.2);
  - The student can take one Skill Based Course (SBC (2)) out of the three given options (II.6.1-II.6.3).

Discipline Specific Core (DSC): 04 Credits

DSC 4 (II.1) Discretizing and Understanding Real Life Situations through Mathematical Lens
Discipline Specific Core

1. Credit Distribution of the Course

Course title & Code DSC 4 (II.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Discretizing and Understanding Real Life Situations through Mathematical Lens	4	3	0	1	Undergraduate	Mathematics in Class XII

2. Learning Objectives

This paper aims to help students understand the basic concepts of linear algebra, enabling them to solve various physical problems, such as balancing chemical equations, analyzing network flow, calculating electric circuit flow, etc. Linear algebra concepts have wide applications in many fields, such as economics, physics, natural sciences, social sciences, data sciences, engineering, etc. Additionally, the course covers the basic concepts of graph theory and their applications in the life sciences and other fields. This paper also explores the relationship between graph theory and linear algebra. The lab activities provide hands-on experiments using suitable software.

3. Learning Outcomes

After completing this course, students should be able to;

- Understand the geometrical concepts of linear algebra
- Apply the concept of linear systems to solve real-life problems
- Understand the concept of transformations and their applications in computer graphics & other fields
- Understand the importance of graphs and their applications
- Understand theoretical and practical knowledge of linear algebra and graph theory
- Understand the relationship between graph theory and linear algebra
- Understand the assignment problem and their importance in real-life
- Learn hands-on experiments using suitable software
- Create projects using fundamental knowledge in order to provide a hands-on experience of the same.

4. Syllabus

Unit I: Vectors and geometry, matrices, multiplication, transpose, determinants, inverses, echelon form, Gaussian elimination, linear dependence and independence, solution and application of system of linear equations. **[12 hours]**

Unit II: Linear transformations and their applications. introduction to sub-spaces and bases, rank, eigenvalues and eigenvectors. **[9 hours]**

Unit III: Graphs (Bipartite, Euler, Hamiltonian, Planar), graphs and adjacency matrices, Euler's V-E+F=2 theorem and its applications, subdivisions, Kuratowski's theorem and application. **[12 hours]**

Unit IV: Matching, Hall's Marriage theorem and application, assignment problems, counting sets, subsets, multisets, inclusion/exclusion, applications. **[12 hours]**

5. Illustrative Practical Details **[30 hours]**

- Representation of vectors in 2D and 3D
- Dealing with matrices and arithmetic operations
- Matrix formulation and solution of linear systems
- Geometric transformations of images: translation, scaling, rotation, etc.
- Analyzing and visualizing graphs
- Graphs and adjacency matrices
- Hand-on projects

6. Essential Readings

- Lay D.C. (2005). *Linear Algebra and its Applications,* Pearson.
- Poole D. (2010). *Linear Algebra: A Modern Introduction,* Brooks Cole.
- Rosen. K.H. (2008). *Discrete Mathematics and Its Applications,* McGraw-Hill.

7. Suggestive Readings

- Axler, S (2025) Linear Algebra Done Right, Open Access.
- Sterling, M.J. (2009) Linear Algebra for Dummies, Wiley.
- Krantz, S.G (2015) How to Teach Mathematics, American Mathematical Society.

Discipline Specific Core

1. Credit Distribution of the Course

Course title & Code DSC 5 (II.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Arts of Teaching Mathematics	4	3	0	1	Undergraduate	Mathematics in Class XII

2. Learning Objectives

The paper develops pedagogical and assessment paradigms to facilitate math learning for all. Students will develop creativity, logic and concept building skills. The humanistic and realistic approach developed through the paper is rooted in belief that leaners construct the knowledge on their own in a stimulating environment.

3. Learning Outcomes

- able to understand theoretical framework for theories of teaching of Mathematics;
- able to learn the strategies to facilitate the culture of learning in math classroom;
- able to identify critical content areas in math classroom and to relate it to the
- research practices;
- able to understand different approaches of assessment;
- able to develop and interpret assessment plans for diverse abilities learners;
- able to develop content specific resources for math teachers.

4. Syllabus

Unit I Theories of Teaching and learning of Mathematics - Styles and strategies for teaching mathematics, theories of learning (Dewey, Bruner, Piaget, Denies, Vygotsky) connecting theory and practice in mathematics teaching, facilitating culture of learning in mathematics classroom. **[10 hours]**

Unit II Addressing Pedagogical Concerns in Mathematics classroom - Critical content of school mathematics: Numbers, Algebra, Geometry, Probability and Statistics, Calculus, limits and continuity with emphasis on research in teaching and learning. **[10 hours]**

Unit III Assessment for Active Mathematics learning - Models of assessment, Assessment for learning and assessment of learning, assessment for teaching, interpreting assessment, developing assessment plan for diverse learners. **[9 hours]**

Unit IV Resources for Mathematics Teacher across Curriculum - Mathematics as a discipline of interdisciplinary approach, creative ways of developing mathematical ideas across curriculum; Learning Mathematics through Minds on and Hands on, facilitating learning using active use of resources, developing innovative resources to develop mathematical ability (games, puzzles, models, hands on kits) Practicum: Focused Discussion Forum to initiate dialogue and sharing on School Internship Experiences. **[16 hours]**

5. Illustrative Practical Details: **[30 hours]**

- Develop concept maps of a mathematical unit.
- Prepare unit plan based using one or more learning theories.
- Develop differentiated instructional strategy based learning-teaching resource.
- Develop relevant home assignment using multidisciplinary or interdisciplinary approach.
- Make a blueprint of formative and summative assessment for a math unit of your choice.
- Design a layout of constructive math classroom.

6. Essential Readings

- Skemp R. (1987). The Psychology of Learning Mathematics. Lawrence E Hillsdale.
- Black P., Harrison C., Lee C., Marshall B. & Wiliam. D (2003). *Assessment for Learning: Putting it into Practice*, Open University Press.
- Wiliam D. (2005). *Inside the Black Box: Raising Standards Through Classroom Assessment,* NFER Nelson.
- Mitchelmore M. & White P. (2010). *Teaching Mathematical Concepts: Instruction for Abstraction,* Australian Catholic University National, Sidney Australia.

7. Suggestive Reading

- Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*(5), 389–407. https://doi.org/10.1177/0022487108324554
- Skemp, R. R. (2006). *Relational understanding and instrumental understanding*. Mathematics Teaching in the Middle School, *12*(2), 88–95.
- National Council of Teachers of Mathematics (NCTM). (2014). *Principles to actions: Ensuring mathematical success for all.*
- Polya, G. (1957). *How to solve it: A new aspect of mathematical method* (2nd ed.). Princeton University Press.
- Dienes, Z. P. (1960). *Building up mathematics*. Hutchinson Educational.

DSC 6 (II.3) Curriculum: Nature, Theories and Models
Discipline Specific Core

1. Credit Distribution of the Course

Course title & Code DSC 6 (II.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Curriculum: Nature, Theories and Models	4	3	0	1	Undergraduate	-

2. Learning Objectives

The broad aim of this course is to develop holistic understanding of "Education" as a developmental force and how the purpose of education conceptualizes the idea of curriculum selection and legitimization of formal curriculum content. It further facilitates the students' understanding on social influences on the aims of education and its' impact on the curriculum planning and implementation with focus on school Mathematics Curriculum. The course focuses on understanding aims of teaching Mathematics as continuum from narrow aims to higher aims; organization of Mathematics Curriculum (in the light of latest NCF, Position Paper on Teaching of Mathematics with special focus on twin premises of learning mathematics and universalization of schooling).

3. Learning Outcomes

- able to understand theoretical constructs of curriculum development;
- able to analyse curriculum development models;
- able to understand the role of various organizations in curriculum development process;
- able to conceptualize the idea and need of National Curriculum Framework;
- able to differentiate between narrow and higher aims of teaching Mathematics.

4. Syllabus

Unit I: Perspectives in Curriculum with reference to society, power and knowledge selection Analysis of curriculum as intent and as reality; curriculum as the reflection of educational ideas and aspirations to be operationalized; curriculum as means to provide experiences to realize educational proposal into practice, Analysis of assumptions: the nature of knowledge, the nature of the child and the nature of the society, Debate on selection of knowledge, Debate on competing conception of balance and development of individual needs and the needs of the society.

[15 hours]

Unit II: Process of curriculum development, Analysis of models: 'Objective model' and Process model', approaches to curriculum development: Role of central and state governments of India, Centralized and decentralized curriculum development, Evaluation of curriculum as a whole. **[8 hours]**

Unit III: Concept of a National Curriculum Framework vs National Curriculum Concept of curriculum framework, Kinds of curriculum framework, Curriculum in a democratic setup, Curriculum to facilitate and respect diversity, Concept of a National Curriculum Framework rather than a National Curriculum to help establish uniformity of democratic and secular norms, with the flexibility of approach and local contextually. **[13 hours]**

Unit IV: Understanding aims of teaching mathematics as continuum from narrow aims to higher aims, Organization of Mathematics Curriculum (in the light of latest NCF, Position Paper on Teaching of Mathematics with special focus on twin premises of learning mathematics and universalization of schooling). **[9 hours]**

5. Illustrative Practical Details: **[30 hours]**

- Time line on development of reforms in Mathematics Education in India/ Comparative analysis of International Mathematics Curriculum
- Critical review of an existing curriculum
- Design a mini-curriculum unit
- Comparative analysis of different boards of math curriculum

6. Essential Readings

- Valley A.K. (2009). *The Curriculum: Theory and Practice,* Sage Publication.
- Ornstein A.C., Pajak E.F., Ornstein S.B., (2014). *Contemporary Issues in Curriculum*, Pearson.
- Li Y. & Lappan G. (Eds.) (2014). *Mathematics Curriculum in School Education,*. Springer Publishers.
- NCTM. (2007). *Perspectives on the Design and Development of School Mathematics Curricula.*
- Null W. (2011). *Curriculum: From Theory to Practice,* Rowman & Littlefield Publisher.
- Reys B. & Reys R. (2010). *Mathematics Curriculum: Issues, Trends, and Future Directions* (Seventy-second Yearbook), NCTM.
- Ernest P., Greer, B. & Sriraman B. (2009). *Critical Issues in MathematicsEducation,*Information Age Publishing.

7. Suggested Readings

- Tyler, Ralph W. (2013) Basic Principles of Curriculum and Instruction. The University of Chicago press.
- Murray (1993) Curriculum Development and Design Practical guide to curriculum planning with models and frameworks. Publisher: Allen & Unwin
- Ornstein, A. C., & Hunkins, F. P. (2018). Curriculum: Foundations, Principles, and Issues. Pearson.

Discipline Specific Electives (DSE): 04 Credits

DSE (II.4.1) Digital Technology in Education
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (II.4.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Digital Technology in Education	4	2	0	2	Undergr aduate	-

2. Learning Objectives

NEP mandates an ICT-embedded pedagogy in education. This paper builds up pedagogical orientation to integrate all types of digital technologies such as hardware, software, online platforms and resources into the mathematics classroom.

3. Learning Outcomes

- Knowledge and expertise in ICT integration in pedagogy
- Knowledge and practice of ICT tools in diverse teaching & learning environments
- Knowledge of online resources, apps, games for enhancing learning
- Expertise in e-content creation

4. Syllabus

Unit I ICT embedded Mathematics Pedagogy - Hardware & Software integration for a smart mathematics classroom. Blended learning paradigm in mathematics pedagogy. Digital resources for enhanced teaching & learning. Learning Management Systems (LMS). **[8 hours]**

Unit II Digital Technology in Mathematics Classroom - ICT tools in the mathematics classroom: Desmos, Geogebra, Scilab, CMAP etc. Augmented Reality (AR), Virtual Reality (VR) and Artificial Intelligence (AI) applications in teaching & learning. Learning Analytics & Adaptive Learning Systems. ICT tools for the inclusive classroom. **[9 hours]**

Unit III Exploring Mathematics through Online Resources - Online learning environment: websites, apps, blogs, virtual classroom, games etc. Collaborative learning. Online assessment. **[7 hours]**

Unit IV Digital Content Development - Preparing E-content/E-resource/E-assessment/web-based classroom (Latex, Beamer, TikZ, HTML, Forms etc.) **[6 hours]**

5. Illustrative Practical Details **[60 hours]**

- Overcoming technology phobia: hardware & software integration for a smart classroom
- Designing Flipped classroom
- Define T in TPACK for an ICT-embedded mathematics pedagogy
- Design Thinking and LMS
- Desmos, Geogebra, Scilab, CMAP exercises
- AI in a mathematics classroom
- Teaching and Learning Analytics using Python
- Gamification of mathematics learning
- Designing an ICT enabled inclusive classroom
- E-content using LaTeX
- E-Assessment using an online form
- Online classroom for collaborative learning

6. Essential Readings

- Oldknow A. (2011). *Mathematics Education with Digital Technology,* Continuum.
- Wilson A.C., Robutti O. & Sinclair N. (Eds.) (2014). *The Mathematics Teacher in the Digital Era* (Vol II), Springer.

7. Suggestive Reading

- Selwyn, N. (2016). *Education and technology: Key issues and debates* (2nd ed.). Bloomsbury Academic.
- Roblyer, M. D., & Hughes, J. E. (2018). *Integrating educational technology into teaching: Transforming learning across disciplines* (8th ed.). Pearson.
- Luckin, R. (2018). *Machine learning and human intelligence: The future of education for the 21st century*. UCL Institute of Education Press.

DSE (II.4.2) Education for Sustainable Future
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (II.4.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Education for Sustainable Future	4	3	1	0	Undergraduate	-

2. Learning Objectives

This course presents the concept and need of sustainability and the role of education in promoting sustainable development. It examines sustainability challenges from a global perspective and the educational strategies to foster historical consciousness, environment awareness, social sensitivity, and economic resilience. The course emphasizes 21st century skills of critical thinking, ethical reasoning, problem-solving skills, and resilience for a sustainable future.

3. Learning Outcomes

- explain the concept of sustainability and the need of a sustainable future;
- able to understand the role of education in sustainable development;
- able to appreciate the need and scope of curriculum for a sustainable future;
- role of education in addressing environmental, social, and economic sustainability challenges;
- examine global and national policies related to sustainability in education;
- design educational interventions that promote sustainable living practices and responsible citizenship.

4. Syllabus

Unit 1 Foundations of Sustainable Development (ESD): Concept of sustainability and sustainable development; historical perspectives on sustainability in education; Sustainable Development Goals (SDGs) and role of education. **[15 hours]**

Unit II Types of Sustainability: Environmental sustainability; Economic sustainability; Social sustainability; Aims and objectives for sustainable future. **[8 hours]**

Unit II Curriculum for Sustainability: Diversifying curriculum around critical areas for interventions to achieve sustainable development goals; Pedagogical strategies to meet the curriculum needs; Practicing sustainability. **[15 hours]**

Unit IV Policies and Practices for a Sustainable Future: Global and national policies on Education for Sustainable Development (ESD). **[7 hours]**

5. Tutorial Details

1. Conduct a survey of your any institution (energy use, plastic usage, water management, green spaces).Present findings as a report or infographic on sustainability issues. Include action suggestions and "green" alternatives. (Hands-on research and problem-solving)

2. Film a 3–5 minute video that explores a local sustainability issue (e.g., pollution, waste, loss of biodiversity) and proposes educational solutions. It can include: Interviews with community members or teachers, Field visits or observation clips and Builds real-world awareness and digital storytelling skills.

6. Essential Readings

- Nikolopoulou A., Abraham T. & Mirbagheri F. (2018). *Education for Sustainable Development: Challenges, Strategies and Practices in a Globalizing World,* Sage Publication.
- UNESCO, MGIEP. (2017). *Textbooks for Sustainable development.*
- Filho, W.L. & Pace P. (Eds). (2016). *Teaching Education for Sustainable Developmentat University Level,* Springer.
- NCERT. (2005). *Education for sustainable.*

7. Suggestive Reading

- UNESCO's. (2023). Education for Sustainable Development: A Roadmap.
- UNESCO's. (2023). Education for Sustainable Development for 2030 Toolbox.
- Jain, M., & Jain, S. (2012). *Education for sustainable development: A sourcebook for teachers*. Centre for Environment Education (CEE).
- *development*. National Council of Educational Research and Training.
- Tilbury, D., Stevenson, R. B., Fien, J., & Schreuder, D. (2002). *Education and sustainability: Responding to the global challenge*. IUCN.

DSE (II.4.3) Research Investigations in Mathematics Education
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (II.4.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Research Investigations in Mathematics Education	4	3	1	0	Undergraduate	-

2. Learning Objectives

The paper highlights the significant features of mathematics education as a dynamic research field. It lays emphasis on developing critical understanding on issues and investigations in mathematics curriculum, pedagogy and assessment.

3. Learning Outcomes

- Understand the nature of mathematics education research;
- Identify the key emerging trends in mathematics education;
- Examine contemporary issues and challenges in mathematics education;
- Explore interdisciplinary perspectives in mathematics education research;
- Critically review and analyse seminal research contributions in mathematics education.

4. Syllabus

Unit I Trends and Issues in Mathematics Education Research - Mathematics Educations as a dynamic field with growing input from research, place and purpose of mathematics education research, trends in mathematics education, ethical issues in mathematics education research. **[16 hours]**

Unit II Interdisciplinary Research in Mathematics Education - Exploring potential research area, research design in Mathematics Education; Debates in Mathematics Education. **[12 hours]**

Unit III International Organizations working in Mathematics Education - Comparative, Collaborative and Cross cultural research in Mathematics Education. **[10 hours]**

Unit IV Learning from Existing Research Practices - Reviewing seminal research work in Math education. **[7 hours]**

5. Tutorial Details

1. Prepare a research literature review matrix for any relevant research topic of your choice in mathematics education.

2. Prepare a comparative analysis sheet of six research journals in mathematics education.
3. Prepare a poster presentation for a seminal research that made a significant contribution in mathematics education.

6. Essential/Recommended Readings

- Lester F.K. (Ed.). (2007). *Second Handbook of Research on Mathematics Teaching and Learning,* Information Age Publishing.
- Schoenfeld A.H. (Ed.). (2007). *Assessing Mathematical Proficiency,* Cambridge University Press.
- Cobb P. & Bauersfeld H. (Eds.). (1995). *The Emergence of Mathematical Meaning: Interaction in Classroom Cultures,* Lawrence Erlbaum Associates.

7. Suggestive Reading

- Burton, L. (2004). *Mathematics education and language: Interpreting research in mathematics education*. Routledge.
- Lester, F. K. (Ed.). (2007). *Second handbook of research on mathematics teaching and learning*. Information Age Publishing.
- Leung, A., & Cai, J. (Eds.). (2015). *Research in mathematics education: Theories, practices, and new directions*. Springer.

DSE (II.4.4) Insights into Educational Data
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (II.4.4)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Insights into Educational Data	**4**	**3**	**0**	**1**	**Undergraduate**	**-**

2. Learning Objectives

The course will develop a sound understanding of fundamental concepts of handling educational data and analysis, and interpretation. Learners will be engaged with key data sources in education from Indian and International data sources. The course will help learners to develop analytical and critical skills to interpret data and utilize data driven insights to inform educational policies and practices.

3. Learning Outcomes

- Identify key sources of Indian and International educational data;
- Apply data extraction, data analyse and data visualization techniques using suitable software tools;
- Analyze and visualize educational data using suitable software tools;
- Interpret data insights for evidence-based recommendations for policy and practices;
- Apply data analytical skills to address contemporary educational challenges.

4. Syllabus

Unit I Nature and Sources of Education Data Analytics - Introduction to Educational Data; Types of Educational Data: Structured vs. Unstructured Data; Sources of Educational Data in India: School education and higher education (UDISE+, NAS, ASER, AISHE, CENSUS, UNESCO, World Bank, PISA, TIMSS); Data Ethics, Privacy, Security Concerns and Policy regulations. **[15 hours]**

Unit II Data Collection and Visualization - Data collection methods (primary/secondary sources; surveys, observations, testing, administrative data); Data clearing and wrangling; Basics of data spreadsheet; Data entry and structures using spreadsheet. **[10 hours]**

Unit III Data Visualization and Dashboard - Quantitative data and qualitative data; Basics of data visualization; Tools for data visualization; Creating Interactive Dashboard . **[8 hours]**

Unit IV Data Analysis and Interpretation - Creating Interactive Dashboard; interpretation of data using basic statistics; Data driven insights and decision for policy recommendations; Challenges and future trends in educational data analytics. **[12 hours]**

5. Illustrative Practical Details **[30 hours]**

- Hands-on practice in refining raw data from educational data from key sources (UDISE+, NAS, ASER, AISHE, CENSUS, UNESCO, World Bank, PISA, TIMSS).
- Arrange and present the data using spreadsheet and data visualization tools.
- Compare multiple educational data sets using appropriate data analytical tools.
- Create Data dashboard and analytical report using data visualization tools.

6. Essential Readings

- Ferguson R. (2017). *The Impact of Big Data on Education: A Comprehensive Guide*. Routledge.
- Selwyn N. (2014). *Data and Education: The Possibilities and Limits of Learning Analytics*. Routledge.
- Clow D. (2013). *An Introduction to Learning Analytics*. Journal of Learning Analytics.

7. Suggestive Reading

- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2018). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education.
- Knaflic, C. N. (2015). *Storytelling with data: A data visualization guide for business professionals*. Wiley.
- Yau, N. (2013). *Data points: Visualization that means something*. Wiley.

General Elective (GE): 04 Credits

GE (II.5.1) Gamification and Design Thinking
General Elective

1. Credit Distribution of the Course

Course title & Code GE (II.5.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Gamification and Design Thinking	4	3	0	1	Undergraduate	-

2. Learning Objectives

The course presents theoretical frameworks and development processes for gamification and game design. It prepares students to integrate design thinking concepts and protocols in game development. The course will provide necessary skills to use software for game designing.

3. Learning Outcomes

- Explain the concept and theories for gamification;
- Identify the need based context for gamification;
- Develop game design protocols based on theoretical frameworks;
- Use game design tools to create digital tools;
- Integrate design thinking principles in game design.

4. Syllabus

Unit I Gamification: Theories and Framework - Underlying theories of gamification: Motivation theory, Self-Determination Theory, Social Constructivism theory, MDA(Mechanics, Design and Aesthetics) framework, Elements of Game Design: Goals, Targets, Interface, Rules for Rewards, Follow up), Game Mechanics (Points, Levels, Badges, Leaderboards. **[15 hours]**

Unit II Gamification Tools and Platform - Basic Coding for Digital Game Development, Game designing software (Scratch, Unity, Twine), Designing Interactive Simulations. **[10 hours]**

Unit III Design Thinking: Concept and Process - Design thinking as a concept and its' constructs, Key principles of design thinking, Latent need assessment, Problem Framing & Analysis. **[12 hours]**

Uniti IV Innovations in Gamification - UI/UX experience for Educational Games, AR/VR in digital games, Adaptive Learning & Personalized Game Experiences. **[8 hours]**

5. Illustrative Practical Details **[30 hours]**

- Critically analyse physical and digital game.
- Conduct an empathy interview with a target user and create an empathy map.
- Create a digital or paper-based badge and reward system for a classroom or workplace.
- Modify an existing non-gamified learning activity by adding game elements and do the field testing.
- Create a design layout, game element matrix and design the game.

6. Essential Readings

- Brown, T. (2009). *Change by Design: How Design Thinking Creates New Alternatives for Business and Society.* Harper Business.
- Salen, K. & Zimmerman E. (2004). *Rules of Play: Game Design Fundamentals.* MIT Press.
- Kapp, K.M. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education.* Pfeiffer.

7. Suggestive Reading

- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). *From game design elements to gamefulness: defining"gamification."* In Proceedings of the 2011 annual conference extended abstracts on Human Factors in Computing Systems (pp. 2425-2428).
- Surendeleg, G., & Yoon, J. (2020). *Gamification in education: A systematic review of the literature*. Springer.

GE (II.5.2) Entrepreneurship for Social Change
General Elective

1. Credit Distribution of the Course

Course title & Code GE (II.5.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Entrepreneurship for Social Change	4	3	1	0	Undergraduate	-

2. Learning Objectives

The course aims to develop entrepreneurship skills among students to turn educational challenges into social impact initiatives. The skills include: identifying opportunities for educational change; planning the framework and evaluating the plans for practical feasibility.

3. Learning Outcomes

- understand entrepreneurship as a mindset;
- analyse social impact models of entrepreneurship;
- understand the scope and challenges in social entrepreneurship.
- understand the role of education in sustainable development;

4. Syllabus

Unit I Core Concepts of Entrepreneurship - Entrepreneurship as a concept, entrepreneurship mind-set, social impact models of entrepreneurship, skills for entrepreneurship. **[10 hours]**

Unit II Planning for Social entrepreneurship - Identifying and evaluating entrepreneurship opportunities, Basics of Start-up finance and budgeting, Writing a business plan, Funding sources: Bootstrapping, angel investors, venture capital, crowdfunding. **[13 hours]**

Unit III Sustainable Business Models - Issues and challenges in social entrepreneurship, viable entrepreneur models: revenue model, non-profit, CSR based education Start-ups, Public-Private Partnerships (PPP). **[12 hours]**

Unit IV Trends in Entrepreneurship and Sustainability - Sustainable Development Goals (SDGs) & Social impact, Indian Start-up ecosystem, Ethical considerations and policy regulation. **[10 hours]**

5. Tutorial Details

1. Discuss case study of a social entrepreneur highlighting the problem addressed, problem addressed, innovative solution, impact and outcomes lessons to learn.
2. Prepare and present a pitch for a social venture idea.

6. Essential Readings

- Nicholls A. (2006). *Social Entrepreneurship: New Models of Sustainable Social Change.* Oxford University Press.
- Elkington J. & Hartigan P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets That Change the World.* Harvard Business Press.
- Dees J.G., Emerson, J. & Economy P. (2001). *Enterprising Nonprofits: A Toolkit for Social Entrepreneurs.* Wiley.
- Fayolle A. (2010). *Handbook of Research in Entrepreneurship Education: International Perspectives*, Edward Elgar Publishing Limited.

7. Suggestive Reading

- Gupta A., George G. & Fewer T.J. (2024). *Venture Meets Mission: Aligning People, Purpose, and Profit to Innovate and Transform Society*. Stanford University Press.
- Bornstein, D., & Davis, S. (2010). *Social entrepreneurship: What everyone needs to know*. Oxford University Press.
- Martin, R. L., & Osberg, S. (2015). *Getting beyond better: How social entrepreneurship works*. Harvard Business Review Press.

Skill Based Course (SBC): 02 Credits

SBC (2) (II.6.1) Academic Writing and Ethical Practices
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (2) (II.6.1)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Academic Writing and Ethical Practices	2	1	0	1	Undergraduate	-

2. Learning Objectives

The course prepares students to the key principles of academic writing, types of academic writing, analytical and reflective writing and structures of references & citation. It introduces to students the issues of plagiarism, copyright, and responsible use of Gen AI.

3. Learning Outcomes

- develop key structures and conventions of academic writing;
- write and coherent academic argument with authentic scholarship;
- use referencing skills and appropriate citation styles (APA, MLA, Chicago, etc.);
- avoid plagiarism and misrepresentation in academic work;
- conscious use of ethical practices and academic integrity in research and academic publishing.

4. Syllabus

Unit I Purpose and characteristics of academic writing - Key Principles and structure of academic writing, Paraphrasing, summarizing and quotations, Referencing styles and citation management software. **[8 hours]**

Unit II Ethical Practices in Academic Writing - Plagiarism and use of Gen AI, Copyright, academic integrity in collaborative writing and publishing. **[7 hours]**

5. Illustrative Practical Details **[30 hours]**

- Prepare a comparative matrix for writing styles (journal, book, newsletter).

- Rewrite an informal piece of writing into formal academic style.
- Analyse and refine weak thesis statements into academic arguments.
- Paraphrase an academic piece of work while maintain the inherent essence of the writing.

6. Essential Readings

- Swales J.M. & Feak C.B. (2012). *Academic Writing for Graduate Students: Essential Tasks and Skills,* University of Michigan Press.
- Lipson C. (2013). *Cite Right: A Quick Guide to Citation Styles.* University of Chicago Press.
- Bailey S. (2018). *Academic Writing: A Handbook for International Students.* Routledge.

7. Suggestive Readings

- Pears, R., & Shields, G. (2019). *Citation and referencing: A guide for academic writing.* Palgrave Macmillan.
- Gabriel, T. S. (2010). *The ethical writer: A guide to writing with integrity in academic and professional contexts.* Pearson.

SBC (2) (II.6.2) Social-Media for Educational Communication
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (2) (II.6.2)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Social-Media for Educational Communication	2	1	0	1	Undergraduate	-

2. Learning Objectives

The course prepares learners to understand the role of social media in modern educational communication. It will help learners to develop effective strategies for effective communication through content writing, information dissemination and professional networking. Students will be equipped with knowledge and understanding of ethical concerns and responsible use of social media for educational purposes. Evaluate the ethical and privacy concerns associated with social media use in education.

3. Learning Outcomes

- understand the use and type of social media in educational communication;
- apply social media strategies in learning communities;
- build professional working networks using social media platforms for academic collaborations;
- address ethical concerns and privacy issues in the use of social media;

4. Syllabus

Unit 1 Introduction to Social Media in Education - Digital literacy and media fluency, role of multimedia (videos, infographics, podcasts) in educational communication, popular media platforms: Facebook, Twitter, LinkedIn, YouTube, Instagram, TikTok, and educational blogs. **[7 hours]**

Unit 2 Strategies for integrating social media in education ecosystem - Use of social media in classroom, social media for academic networking and professional development (LinkedIn, ResearchGate, and Twitter), Ethical considerations and responsible social media use. **[8 hours]**

5. Illustrative Practical Details **[30 hours]**

- Compare and list best practices of different social media platforms (Facebook, X/Twitter, LinkedIn, YouTube, Instagram, Threads) for educational engagement and ethical practices.
- Create a professional social media profile as an education specialist for academic purposes.
- Develop content strategies using social media for flipped classroom.
- How to use an academic search engine for professional networking?

6. Essential Readings

- Richardson W. (2010). *Blogs, Wikis, Podcasts, and Other Powerful Web Tools for Classrooms,* Corwin Press.
- Cain J. & Policastri A. (2011). *Using Social Media in the Classroom: A Best Practice Guide,* Routledge.
- Garrand, T. (2024). *Writing for Interactive Media.* Routledge.

7. Suggestive Readings

- Lister, M., & Pritchard, P. (2020). *Digital storytelling in the classroom: New media pathways to literacy, learning, and creativity*. Routledge.
- Winer, D. (2019). *The social media workbook for educators: A step-by-step guide to crafting a social media strategy for your classroom*. Routledge.
- Veletsianos G. (2020). *Learning Online: The Student Experience,* Johns Hopkins University Press.

SBC (2) (II.6.3) Learning Ways of Mathematical Writing
Skill Based Course

1. Credit Distribution of the Course

Course title & Code SBC (2) (II.6.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Learning Ways of Mathematical Writing	2	1	0	1	Undergraduate	-

2. Learning Objectives

The course focuses on the fundamentals of mathematical writing with precision and accuracy. It enables students to write quality mathematical content that is conceptually and pedagogically sound quality mathematics content. The course will focus on variety and nature of mathematical content.

3. Learning Objectives

- understand the structure of mathematics as a language;
- learn the way of effective mathematical writing;
- use mathematical vocabulary in everyday communication;
- critically examine mathematical content through different sources and in different time periods.

4. Syllabus

Unit I Mathematics as a language and expression - Features of mathematical language, essential rules of mathematical writing, technical aspect of mathematical writing, mathematical definitions, mathematical proofs and algorithms. **[8 hours]**

Unit II Learning through exemplary pieces of mathematical writings - Critical analysis of mathematical content in textbooks, reference books and research based books, review of exemplary pieces of mathematical writing. **[7 hours]**

5. Illustrative Practical details **[30 hours]**

- Use Frayer's model for defining mathematical concepts.
- Use Polya's problem solving framework for higher order thinking skills
- Develop meta-cognition strategies for problem solving skills
- Develop text-book analysis blueprint and analysed a math textbook.

6. Essential Readings

- Vivaldi F. (2014). *Introduction to mathematical writing*, School of Mathematical Sciences, The University of London.
- Krantz S.G. (1997). *A primer of mathematical writing*. American Mathematical Society.
- Knuth D.E., Larrabee T. & Roberts P.M. (1989). *Mathematical writing*, Mathematical Association of America.

7. Suggestive Readings

- Polster, B. (2011). *Mathematical writing*. Springer.
- Zick, D. (2014). *How to write mathematics*. Cambridge University Press.