



Central University of Rajasthan

(Education for Sustainable Development)

NH-8 Bandarsindri, Kishangarh, District Ajmer , Rajasthan

School of Education

(Proposal of Integrated Programmes)

The three years M.Sc. B. Ed. Curriculum is meant for preparing teachers specifically for the senior secondary stage of school education. Hence, it can only include the knowledge domains appropriate for teaching at the senior secondary stage of education. There exist two main models of teacher education programmes in India. The *long duration integrated model* wherein the subject matter knowledge is learnt alongside professional education courses and the *short duration model* in which the student would have already acquired a degree in the subject to be taught by him/her. This curriculum is meant for the first model.

While deciding on the courses and the structure, the domains of teachers' knowledge as outlined under the "Teacher Education Programmes: Curriculum" in the *International Encyclopedia on Education* namely, 'subject matter knowledge', 'pedagogical knowledge' and 'pedagogical content knowledge' were considered. Of these knowledge domains, the subject matter knowledge required for teaching at the senior secondary level is presumed to be learnt at the secondary and the undergraduate programmes.

It is felt that a teacher to be a truly professional practitioner requires a conceptual understanding and appreciation of the above domains of knowledge and also the competence to implement the knowledge in specific contexts of teaching. In order that the teacher education programme to become a professional preparation programme, it should have a fair combination of theory and practice. Too much of theory would push the teacher education programme towards liberal arts orientation and hence prepare a disciplinarian rather than an efficient and effective practitioner. What the country needs today is *sound practitioner teacher* rather than those who merely verbalise theoretical knowledge. One way of achieving this would be to have a proper blending of reflections on theoretical basis and sufficient opportunities for practice followed by feedback.

The NCFTE (2009) has provided a suggestive framework for teacher education programmes. It is needless to say that a long duration programme of teacher education will be more comprehensive in its coverage of the suggested courses than a short duration programme, which needs to be selective. The committee has made deliberate attempts at incorporating as many courses from the NCFTE as possible, though in a reorganized structure. The courses in this curriculum are arranged under five areas namely, Foundations of Education, Pedagogical Knowledge, Pedagogical Content Knowledge, School Based Experiences and Add-on Courses instead of three areas as suggested in NCFTE.

In India, teacher education has been an isolated phenomenon in the field of higher education which was mainly concentrating on primary and secondary school teachers. But it is lately realized by the Universities that in order to enhance quality in teacher education, they should integrate teacher education programmes with curricula across disciplines and faculties. This integration is also essential to develop teaching skills for those who opt for teaching profession in colleges and universities after completion of Ph.D. and Post-doctoral Research. This is the first attempt made by the Central University, Rajasthan with a clear focus on preparing teachers for Junior Colleges . From the next academic session 2014-15, the Central University of Rajasthan has proposed to introduce Integrated M.Sc., B.Ed. and Integrated M.Sc. programmes in the following subjects under the School of Education:

Integrated M.Sc., B.Ed in the following subjects:

- 1 Physics
- 2 Chemistry
- 3 Mathematics
- 4 Economics

The integrated Programme proposed by the university is innovative and will be the unique programme of its kind in the state of Rajasthan.

The salient features of the Integrated programme:

- The 3 year integrated teacher education programme focuses on the theory of education, pedagogical skills and subject content knowledge required for senior secondary level.
- The curriculum is open enough to incorporate the evolving pedagogical developments.
- The duration of Integrated M.Sc. B.Ed. Programme is of 3 Years (6 Semesters). In last two semesters of Integrated M.Sc., B.Ed. Programme (V and VI Semesters), the students will be placed in Senior Secondary Schools/Junior College for internship under the supervision of a mentor.
- The programme offers Integrated M.Sc. B.Ed. (3 years duration) in four subjects (Mathematics, Physics, Chemistry and Economics)
- The Course structure is designed to prepare students for teaching profession in senior secondary schools.

Eligibility: B.Sc. Graduate

School of Education

As per the vision of The Central University of Rajasthan, various Schools of Studies have already been established by the university. Looking to the need for strengthening education at all levels of education in the state of Rajasthan, there is an urgent need for establishing School of Education to provide Integrated Innovative teacher education programmes.

The University Grants Commission has already indicated for the need of providing teacher education by the universities under the National Mission on Teachers and Teaching. The Central University of Rajasthan is keen to participate in this mission to strengthen Teacher Education by creating additional capacity for preparing qualified teachers.

The School of Education will have following Centres to perform various functions as proposed:

- Centre for Pre-service Teacher Education
- Center for Curriculum Research Policy & Educational Development
- Centre for Learning & Pedagogic Studies
- Centre for Assessment and Evaluation
- Centre for the Professional Development of teachers and Teacher Educators
- Center for Teachers Resource and Academic Support

The University is situated in the rural setting on National Highway – 8 at Bandarsidri, Kishangarh of Ajmer district. It is surrounded by villages having primary, secondary and some Senior Secondary Schools. Therefore, the university has a scope of research in teacher education and developing learning models for applications and generating data for farming policy for educational development for rural areas.

Besides its core functions, the School Education will play a crucial role in extending training to various stake holders of the university and nearby community:

- The School of Education will organize Orientation Programmes for Elementary, Secondary and Senior Secondary teachers and provide pedagogy, techniques and teaching skills to the teachers.
- The School of Education will provide opportunity to young faculty members of the university for training teaching techniques and skills.
- The Central University of Rajasthan is going to establish Community College from the next academic session 2014-15. Therefore, the School of education will be helpful in providing service to the community, specially to the students who opt for some work for self-employment.
- The Central University of Rajasthan has already established a business Incubation Centre in the university. Therefore, young entrepreneurs may also have some training to extend their business in future.

The Central University of Rajasthan has created state-of-the-art infrastructure for post graduate programmes and research. Also, the university has teaching faculty for academic programmes. The proposed integrated programmes are designed with integration of various schools/departments. This will augment in depth interactions across the disciplines.

The syllabi of various Integrated Programmes have been prepared by the faculty and circulated to eminent subject experts throughout the country for their comments and suggestions. After incorporation of their suggestions in the draft syllabi, these will be finalized by the committee of various disciplines/schools. This will lead to fruitful cross-disciplinary interactions and help the students to develop a contemporary holistic outlook.

The draft syllabi of various Integrated Programmes have been prepared by the faculty and circulated to eminent subject experts throughout the country for their comments and the suggestions. After incorporating their suggestions in the draft syllabi, the curriculum for the M.Sc. B.Ed. degree in the Physics/ Mathematics/Chemistry/ Economics have been finalized by the joint syllabus committee with numbers from all concerned disciplines /schools and the Detailed Curriculum thus revised has been approved by the competent authorities of the University.

Curriculum of Education of the 3 Year M.Sc. B.Ed. Integrated Programme

Semester	Course Code	Credits	Title
I		3	Paper I. Basics of Education
		3	Paper II. Senior Secondary Education in India: Status, Challenges and Strategies
II		3	Paper III. Philosophy of Mathematics/Physics/Chemistry
		3	Paper IV. Learner and Learning
III		3	Paper V. Teaching Approaches and Strategies
		4	Paper VI. Pedagogy of Mathematics/Physics/Chemistry-I
IV		3	Paper VII. Learning Assessment
		4	Paper VIII Pedagogy of Mathematics/Physics/Chemistry-II
V		3	Paper IX. Classroom Organization and Management
		12	INTERNSHIP
VI		04	Project/Dissertation (Review of Researches in the subject)

**CURRICULUM OF THE COURSES ON EDUCATION OF THE THREE-YEAR
M.Sc. B.Ed. INTEGRATED PROGRAMME**

Specific Objectives for education components.

The curriculum is designed to achieve the following objectives of the M.Sc. B.Ed. so as to integrate content, pedagogy and technology-

- 1) The student teacher understands the central concepts, tools of inquiry, and structure of the subjects and can create learning experiences that make these aspects of subject matter meaningful for students.
- 2) The student teacher understands how student learn and develop and can provide learning opportunities that support their intellectual, social and personal development.
- 3) The student understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
- 4) The student teacher understands and uses a variety of instructional strategies to encourage student's development of critical thinking, problem solving and performance skills.

- 5) The student teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning and self motivation.
- 6) The student teacher uses knowledge of effective verbal, non-verbal, ICT and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
- 7) The student teacher plans instruction based upon knowledge of subject matter, students, the community and curriculum goals.
- 8) The student teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.
- 9) The student teacher is a reflective practitioner who continually evaluates effects of his/her choices and actions on others (students, parents and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.
- 10) The student teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students, learning and wellbeing.

Modes of Learning Engagement

With a view to move away from theoretical discourses and lectures, the student teachers will be required to be engaged in various kinds of experiences. Every course in the teacher education programme provides specific engagements that are spelt out under each course. However, the nature of the engagement of the student teachers will be of the following kinds.

Lecture-Discussion Session: The teacher educator provides a platform for review of experiences, develop insights into the disciplinary knowledge base and relate them to school realities.

Lecture cum demonstrations

Focussed small group discussions

Focused reading and Reflection: Student teachers would be lead into focussed readings on various themes with questions involving reflections either individually or in small groups.

Observation-Documentation –Analysis: Simulated and real school/community experiences would be arranged for the student teacher to observe, document in the form of record/journal/diary and analyze with an intention to revisit their own understandings or develop new insights.

Seminar: Students will undertake thematic/topical study, prepare write-up and make seminar presentation using ICT, followed by open house discussion with a view to enhance their knowledge base and repertory of skills in the area of presentation.

Workshop: A series of learning experiences in a given performance area would be provided in the form of workshop engaging them in modelling-practice-

feedback sequence with a view to develop specified competencies required for a teacher

Case Study: An in-depth and comprehensive study of a single or few cases would be taken up as per the guidelines provided and submit a study report.

Projects, Assignments and Action research.

Institution Based Practical: Observing an experienced practitioner, planning-implementing-receiving feedback from peers and supervisor and reflection on one's own performance would influence development of insights, beliefs and attitudes necessary for a teacher. Learning experiences would be provided through several school/institution based practicum for development of certain professional qualities and competencies. The conceptual and theoretical learning made under various courses would not transfer to the real classroom/school/institutional context unless one makes specific attempts at applying them in relevant contexts. The school /institution based practical would also include opportunities for planning and implementation of learning experiences and strategies and reflecting on their appropriateness and effectiveness.

Modes of Assessment/ Evaluation - Self, Peers and External.

Pre-service teacher education programme provides inputs that are to be internalized through an active process of assimilation and accommodation. Hence assessment needs to be formative and summative, quantitative and qualitative by nature. The emphasis is will be on Continuous and Comprehensive evaluation. The modes of assessment would consist of

- **Self assessment** with the help of various psychometric and educational assessment inventories.
- **Written tests and assignments** for assessing conceptual understandings and clarity
- **Products** of planning and preparation activities such as lesson plan, unit plan, assessment tools, and learning resources.
- **Records/Reports/Reflective Journals and Diaries** maintained by the student teacher of their school based experiences and project work related to different courses
- **Seminar presentations** for assessing ability to review, record, reorganize and present their work on thematic/topical study
- **Laboratory journals/Activity records** for assessing ability to plan and implement laboratory activities on subject specific skills under various pedagogical content courses
- **Observation** of teaching performance using schedules and rating scales ,both in simulated and real classroom contexts, for assessing performance skills and competencies
- **Records/Reports/Reflective Journals and diaries** maintained by the students teacher of their school based experiences and project work related to different courses

- **Laboratory Journals/Activity records** for assessing ability to plan and implement laboratory activities on subject specific skills under various pedagogical content courses
- **Observation** of the student teachers in various contexts of teacher education such as their participation in seminar, professional attitudes and dispositions

Scheme of Assessment /Evaluation

- **The weightage** suggested for formative and summative assessments per course are:
 - a) **Theory- Terminal: 70 Marks**
 - b) **Sessional work: 30 Marks**
 - c) **Practicals (Internship etc.): 100 Marks**

Semester – I

Paper-I: BASICS OF EDUCATION

Contact Hrs per Week: 4

Exam Duration: 3 Hrs

Max Marks: 100

Sessional : 25

Terminal : 75

Course Objectives

The student teachers will be able to

- analyze and understand educational concepts, their premises and contexts that are unique to education.
- understand and appreciate the nature and the purpose of education, their practical ramifications in the school context.
- analyze the philosophical reflections and educational thoughts of great Educational thinkers
- understand the nature of knowledge in Education and its contribution to status of education as a discipline and interdisciplinary in nature
- inquire into the roles of teacher, school and the community in the changing perspectives of pedagogy
- appreciate the historical development of education as a system and its evolving structures
- examine the concerns and issues related to education system
- understand the importance of systemic reforms in achieving quality education

Unit I: Education: Meaning and Nature

- Meaning of Education, Education as an evolving concept: ancient to present- education as an organized, institutionalized, formal and state sponsored activity
- Concepts in education and their changing connotations: school, curriculum, teacher, learner, teaching, learning, instruction, freedom, autonomy and control in relation to the child and teacher
- Shifts in process of education: Knowledge giving, didactic and constructivist interpretations

- Expansion in modes of education: face-to-face (tutorial, small group, large group) to distant modes of education: oral/aural to digital; individualized and group based

Unit II: Aims of Education

- Aims of Education- Education for National Development-Economic, Social and Individual, Education for Value development with reference to Senior Secondary Stage. Changing aims of Education in the context of globalization
- Sources of Aims of Education: Educational aims as derived from the Constitution of India
- Influence of aims of education on the curriculum and transactional strategies
- Ideas of educational thinkers such as Gandhi, Tagore, Aurobindo, Dewey, Krishnamurthy, Friere and Illich

Unit III: Systems and structures of School Education

- Education as a system, Stages, forms, modes and streams of Education and their inter-relationships within.
- Evolution of educational network over the past two centuries (1800s to 21st century): a brief overview of historical development of learning systems that resulted in the present network of schools.
- Role of state-centre: need for a national system of education
- Predominant concerns of the education system– co ordination, quality assurance and feasibility
- Role of Stake holders in Education- Parents, Community, Teachers, Students, Employer.

UNIT IV: Education and Socio-cultural Context

- Education as an instrument of social change- influence of education on society, family and their practices
- Socio-cultural influences on the aims and organization of education
- Social acceptability of educational policy and practice

- Emerging trends in societies and their repercussions on education: globalization and internationalization of education

UNIT V Knowledge and Knowing

- Nature of knowledge in education: concepts, statements, educational viewpoints, metaphors and theories.
- Emerging Knowledge base in education
- Differences between information, knowledge, belief, and opinion
- Ways of Knowing and sources of Knowledge
- Role of culture in Knowing
- Transfer of knowledge into action and reflection on knowledge
- Role of knower and known in knowledge transmission and construction
- Forms of Knowledge and basis of categorization of knowledge
- Facets of School Knowledge and relationship: local and universal; concrete and abstract; theoretical and practical; contextual and textual; school and out of school.
- Interfaces with cognate disciplines such as physical, mathematical, natural and social sciences

Sessional work

Analyse writings on analysis of education-development interface and make presentations

Group discussions, debates and dialogue on the themes

Presentations on National educational policies

Preparation of reports on the state and centrally sponsored schemes of education

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Anand, C.L. et.al.(1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.

Govt. of India (1986). National Policy on Education, Min. of HRD, New Delhi.

Govt. of India (1992). Programme of Action (NPE). Min of HRD.

Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.

Naik, J.P. & Syed, N., (1974). A Student's History of Education in India, MacMillan, New Delhi.

NCERT (1986). School Education in India – Present Status and Future Needs, New Delhi.

Salamatullah, (1979). Education in Social context, NCERT, New Delhi.

Ministry of Education. *Education Commission "Kothari Commission"*. 1964-1966. Education and National Development. Ministry of Education, Government of India 1966.

Learning without Burden, Report of the National Advisory Committee. Education Act. Ministry of HRD, Department of Education, October, 2004.

National Policy on Education. 1986. Ministry of HRD, Department of Education, New Delhi.

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UNDP. *Human Development Reports*. New Delhi. Oxford: Oxford University Press.

UNESCO. (2004) *Education for All: The Quality Imperative. EFA Global Monitoring Report*. Paris.

Semester I

Paper II. SENIOR SECONDARY EDUCATION IN INDIA: STATUS, CHALLENGES AND STRATEGIES

Contact Hrs per Week: 4

Max Marks: 100

Exam Duration: 3 Hrs

Sessional : 25

Terminal : 75

Objectives :

This course is designed to help student-teachers to

- understand the concept, objectives and nature of senior secondary education.
- examine the status of development of senior secondary education in India after Independence.
- understand the interventions required to solve the problems and issues in imparting quality education in senior secondary schools.
- develop the ability to identify the problems and issues of senior secondary school teachers.
- understand the need for alternative schooling.

Unit I: Concept, Nature and Purpose of Senior Secondary Education

Concept of senior secondary education, aims, objectives, scope and nature of secondary education, functions of secondary schools, Linkages with elementary and senior secondary stages.

Concept of Universalization of Secondary Education- Constitutional provisions;

Policies; Right to education and its implications for universalisation of secondary education (USE);

Unit II: Status of Senior Secondary Education

Universalisation of secondary education – access, enrolment, retention and learning achievement of students; Growth of secondary and senior

secondary education during post independence period and current status of USE with reference to the above indicators- All India and state specific figures; status with reference to equity principles-differential-public-private schools, rural –urban-tribal schools, differentials school systems and schools for the education for the of challenged; National Curriculum Framework –2000 and 2005, National Curriculum Framework for Teacher Education (NCFTE) 2009, Examination Reforms, administration and financing of secondary education, problem of teacher training, role of NCTE and curriculum reforms. Impact of realizing the UEE on secondary and senior secondary education: access, enrolment, participation and achievement; status of USE;

Unit III: Problems of and Strategies for Quality Education at Senior Secondary Level

Concept of quality, indicators of quality, quality concerns, challenges and problems related to Access, Enrolment, participation, Retention, and achievement in general and with specific reference to girls, disadvantaged groups [SC, ST and minorities] and Differently abled.

Initiatives by RashtreeyaMadhyamikShikshaAbhiyan (RMSA)to improve quality

Concept of alternative schooling, continuing education centers, problems of out of school children- role of NGOs in continuing education, National Institute of Open Schooling – objectives and functions.

Unit IV Quality assurance, monitoring of Secondary School Education

Roles and functions of different organisations and bodies in ensuring Quality of Secondary schools—CBSE, State Board of Secondary Education,; Quality Council of India- School assessment and accreditation; Improving internal efficiency of the school system, teacher recruitment, professional development, working conditions and staff morale.

Unit V: Professionalization of Senior Secondary School Teachers

Professionalism in teachers – code of professional ethics for Teachers; changing role of the teacher in the new millennium – learning facilitator and diagnostician, Issues related to teacher motivation, working condition both in

urban and rural areas, job satisfaction, issues related to teacher's role performance and role perception, accountability of teachers, Role of teacher organizations and unions in the development and improvement of quality education at the secondary school level.

Sessional Work:

- Preparing status report on secondary education in a chosen block/district with reference to access, enrolment and dropout.
- Preparing a report on the existing status of the teachers, method of recruitment and salary structure.
- Visits to different types of secondary schools and preparation of school profiles.
- Conduct interview with teachers/students/parents of different schools and prepare a report on problems of secondary education.
- Visit to alternative education centres at secondary level and preparation of a report.
- Survey of educational needs of disadvantaged/disabled.

References:

1. Chopra, R.K.(1993) Status of Teachers in India, NCERT, New Delhi.
2. Govt. of India (1953) Report of Secondary Education Commission, New Delhi.
3. Govt. of India (1966) Indian Education Commission (1964-66) Report. New Delhi.
4. Govt. of India (1986/1992) National Policy of Education, 1992, Modification and their POA's MHRD, Deptt. of Education.
5. Kundu, C.L. (Ed) (1984) Indian year Book on Teacher Education, Sterling Publishers Pvt. Ltd., New Delhi.
6. Malhotra, P.L. (1986) School Education in India: Present status and Future Needs, NCERT, New Delhi.
7. NCERT (1997) Code of Professional Ethics for Teachers.

8. NCTE (1998) Competency Based and Commitment Oriented Teacher Education for Quality School Education, Pre-service and in-service programme, New Delhi.
9. NCTE (1998) Policy Perspectives in Teacher Education, New Delhi Peters, R.S. (1971) Ethics and Education, George Allen Unwin Ltd. London.
10. Singh, R.P. (Ed) Teacher Training in India-Looking Ahead Federation of Management & Educational Institutions, New Delhi.

Semester II

Paper III Philosophy of Mathematics

Course Objectives:

Upon completion of this course students should be able to:

- demonstrate a good overall grasp of the main foundational positions concerning mathematics: Platonism, realism, logicism, intuitionism, formalism etc.
- be able to assess the various arguments in favour of, and against, these positions
- understand the relation between debates about the foundations of mathematics and other topics (such as the applicability of mathematics in science)
- understand the historical and cultural development of mathematics and the evolution of mathematical knowledge
- engage students successfully in studies of the nature of mathematics

Unit -1: Mathematics and Philosophy

- Meaning and dimensions of mathematics, Nature of philosophy: Philosophy as mental activity and as an activity of analysis, Relation between mathematics & philosophy, Nature and functions of philosophy of mathematics.
- The views of Plato, Aristotle, Leibniz and Kant on the nature of Mathematics

Unit – 2: Logicism

- Symbolic logic and Mathematics – the Frege and Russell thesis
- Basic symbols, propositions and Proving propositional function
- Calculus of propositions –proving of theorems
- Classes (Sets) and relations: simple and ramified theory of types - axioms of infinity and reducibility
- Conventionalism- necessity and apriority of analytic propositions, Quine's critique of conventionalism

Unit - 3: Formalism

- Basic views & Frege's criticism
- Deductivism and Hilbert's Foundations of Geometry and Finitism and Hebert's proof theory
- Gödel's incompleteness theorems and paradoxes
- Consistency of formal systems
- The significance of Gödel's theorems and related results concerning truth and computability

Unit – 4: Intuitionism

- Basic philosophy of intuitionism
- The philosophical basis of intuitionistic logic
- Intuitionism and constructionism
- The natural members and the definition of set
- Species, Relation between species
- Theory of cardinal numbers
- Order and ordinal numbers

Unit 5: Contemporary Views and the Human Face of Mathematics

- The epistemology of Platonistic mathematics: problems and prospects.
- Empiricist Platonism: Quine's view
- Nominalism: there are no mathematical objects and Fictionalist nominalism
- Structuralism: mathematics is all about structures
- The applicability of mathematics and the indispensability of mathematics
- The cultural setting of mathematics:
- The position of mathematics in the culture, the historical position of mathematics, mathematics from the cultural point of view, the process of mathematical change and growth and the 'mathematics' today.

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Benacerraf, Paul & Hilary Putnam (1984). *Philosophy of Mathematics: Selected Readings*. 2nd Revised edition, Cambridge University Press
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Hart, W. D., editor (1997), *The Philosophy of Mathematics*. Oxford: Oxford University Press.

Jacquette, Dale, editor (2002), *Philosophy of Mathematics: An Anthology*. Malden, MA: Blackwell.

Schirm, Matthias, editor (2003), *The Philosophy of Mathematics Today*. Oxford: Oxford University Press.

Shapiro, Stewart (2000), *Thinking About Mathematics*. Oxford: Oxford University Press.

Shapiro, Stewart, editor (2005), *The Oxford Handbook of Philosophy of Mathematics and Logic*. Oxford: Oxford University Press.
The following books and collections provide an overview of the development of logic and the foundations of mathematics:

Beaney, Michael, editor (1997), *The Frege Reader*. Malden, MA: Blackwell.

Ewald, William, editor (1996), *From Kant to Hilbert: a source book in the foundations of mathematics*. Oxford: Oxford University Press.

Giaquinto, Marcus (2002), *The Search for Certainty: a philosophical account of foundations of mathematics*. Oxford: Oxford University Press.

Haaparanta, Leila, ed., *The History of Modern Logic*. Oxford: Oxford University Press, to appear.

Mancosu, Paolo (1998), *From Brouwer to Hilbert: the debate on the foundations of mathematics in the 1920's*. Oxford: Oxford University Press.

vanHeijenoort, Jean (1967), *From Frege to Gödel: a sourcebook in mathematical logic, 1879-1931*. Cambridge: Harvard University Press.

Following source book includes relevant works by Plato, Aristotle, Descartes, Leibniz, Locke, Berkeley, Hume, and Kant:

Cahn, Steven M. (1999), *Classics of Western Philosophy*. Fifth edition. Indianapolis: Hackett Publishing Company.

For some early twentieth century positions on the philosophy of mathematics, in addition to the collections above, see:

Russell, Bertrand (1993/1919), *Introduction to Mathematical Philosophy*., Minneola, NY, Dover Publications.

Ramsey, Frank Plumpton (1931), *The Foundations of Mathematics and Other Logical Essays*, edited by R. B. Braithwaite. London: Dover Publications
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Quine, W. V. O. (1970), *The Philosophy of Logic*, second edition. Englewood Cliffs, NJ : Prentice-Hall.

Quine, W. V. O. (1995), *From Stimulus to Science*. Cambridge: Harvard University Press.

Whitehead, Alfred North and Bertrand Russell, (1910-1913), *Principia Mathematica*, three volumes. Cambridge: Cambridge University Press. Second edition, 1925-1927.

Wittgenstein, Ludwig (1983), *Remarks on the Foundations of Mathematics*, revised edition. Cambridge, MA: MIT Press.

Some contemporary work along traditional lines in ontology and epistemology include:

Burgess, John, and Gideon Rosen (1997), *A Subject with no Object: strategies for nominalistic interpretation of mathematics*. Oxford: Oxford University Press.

Detlefsen, Michael (1986), *Hilbert's Program: an essay on mathematical instrumentalism*. Dordrecht: Kluwer Academic Publishers.

Hale, Bob, and Crispin Wright (2001), *The Reason's Proper Study: essays towards a neo-Fregean philosophy of mathematics*. Oxford: Oxford University Press.

Hellman, Geoffrey (1989), *Mathematics without Numbers*. Oxford: Oxford University Press.

The following provides a variant of Quinean naturalism:

Maddy, Penelope (1997), *Naturalism in Mathematics*. Oxford: Oxford University Press. For some uses of mathematical logic in philosophy, see:

Feferman, Solomon (1998), *In the Light of Logic*. New York: Oxford University Press.

Sieg, Wilfried (1994), 'Mechanical Procedures and Mathematical Experience.' In Alexander George, editor, *Mathematics and Mind*, Oxford: Oxford University Press.

Tait, William (1981), 'Finitism.' *Journal of Philosophy*, 78:524-546.

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Aspray, William, and Philip Kitcher, editors (1988), *History and Philosophy of Modern Mathematics*. Minneapolis: University of Minnesota.

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For various structuralist views of mathematics, see:

Awodey, Steve (1996), 'Structure in mathematics and logic: a categorical perspective.' *Philosophia Mathematica* 4:209-237.

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Resnik, Michael (1997), *Mathematics as a Science of Patterns*. Oxford: Oxford University Press.

Shapiro, Stewart (1997), *Philosophy of Mathematics: structure and ontology*. New York: Oxford University Press.

For some initial attempts to address broader topics in the epistemology of mathematics, see:

Avigad, Jeremy 'Mathematical method and proof.' To appear in *Synthese*.

Mancosu, P., J. Jorgensen, S. Pedersen, editors (2005), *Visualization, Explanation and Reasoning Styles in Mathematics*. Springer Verlag: Berlin.

Steiner, Mark (1978), 'Mathematical Explanation.' *Philosophical Studies* 34:133-151.

Tymoczko, Thomas, editor (1998), *New Directions in the Philosophy of Mathematics: an anthology*, revised edition. Princeton: Princeton University Press.

Mancosu, P., J. Jorgensen, S. Pedersen, editors (2005), *Visualization, Explanation and Reasoning Styles in Mathematics*. Springer Verlag: Berlin.

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Tymoczko, Thomas, editor (1998), *New Directions in the Philosophy of Mathematics: an anthology*, revised edition. Princeton: Princeton University Press.

Semester-II
Paper-IV: LEARNER AND LEARNING

Contact Hrs per Week: 4

Exam Duration: 3 Hrs

Max Marks: 100

Sessional : 25

Terminal : 75

Course Objectives

Upon completion of the course, student teachers will be able to

- Develop an understanding about the impact/influence of socio cultural context in shaping human development, especially with respect to the Indian context;
- Develop an understanding of dimensions and stages of human development and developmental tasks
- Understand the range of cognitive capacities among learners
- Reflect on their own implicit understanding of the nature and kinds of learning
- Gain an understanding of different theoretical perspectives on learning
- Appreciate the critical role of learner differences and contexts in making meanings, and draw out implications for schools and teachers

Unit 1 Learner as a Developing Individual

- Developmental Influences: Development as a resultant of Interactions between individual potential (Innate, acquired) and external environment (Physical, socio-cultural, ecological, economic and technological). Nature and nurture, continuity and discontinuity issues, growth and maturation.
- Learner as a developing individual; a psycho-social entity; stages of development
- Implications for teachers to develop holistic understanding of learner in context.

Unit 2 Development and Learning

- Dimensions and stages of individual development: physical, cognitive, language, affective, social and moral, their interrelationships and implications for teachers. Piaget, Kohlberg and Erickson), developmental tasks (Havighurst) of Adolescents..
- Meaning of Cognition: Role in Learning; Influence of Socio-cultural factors
- Fostering holistic development of a learner in the context of society – Development of Self (self identity and self esteem) and social responsibility.

Unit 3 Management of Learning

- Nature of learning: learning as a process and learning as an outcome
- Learning: factual, conceptual, procedural, principles and generalizations, rules, attitudes, values and skills (psychomotor)
- Learning thinking skills: Inductive, deductive, Scientific thinking, divergent-convergent, Analysis, Synthesis, Critical thinking, Creative thinking.
- Hierarchy of Learning (Gagne)
- Perspectives of learning and implications for pedagogical principles - behaviouristic, cognitive, humanistic and constructivist; Understanding learning context- Factors Influencing Learning- Internal (Attention, motivation, learning style, study habits, readiness as factors influencing scholastic learning)and External (subject matter content and learning resources, method of learning, learning environment), Role of the teacher, parents, School and community in addressing various factors influencing learning.
- Individual versus group learning: Self learning, cooperative and collaborative learning.
- Paradigms for organizing learning environment: teacher centric, subject centric and learner centric.

- Issue of media influences on learning – role of parents, teachers and School Management

Unit 4 Learning in constructivist perspective

- Distinctions between learning as ‘construction of knowledge’ and learning as ‘transmission and reception of knowledge’
- Understanding processes that facilitate construction of knowledge: (i) experiential learning and reflection (ii) social mediation (iii) cognitive negotiability (iv) situated learning and cognitive apprenticeship and (v) meta cognition.
- Creating facilitative learning environments, teachers’ attitudes, expectations-enhancing motivation, positive emotions, self efficacy, collaborative and self regulated learning.

Unit 5 Understanding Differences in Learners

- Dimensions of differences in psychological attributes-cognitive abilities, interest, aptitude, creativity, personality, values.
- Understanding learners from multiple intelligences perspective with a focus on Gardners theory of multiple intelligences, implications for teaching in the light of changing concept of intelligence, including emotional intelligence.
- Differences in learners based on predominant ‘learning styles’
- Differences in learners based on socio cultural contexts: impact of ‘home language’ of learners and ‘language of instruction’, impact of differential ‘cultural capital’
- Understanding differences based on range of cognitive abilities-learning difficulties, slow learners and dyslexics, intellectual deficiency, intellectual giftedness. Implications for catering to individual variations in view of ‘difference’ rather than ‘deficit’ perspective.
- Methods of assessing individual differences: tests, observation, rating scales, self-reports, portfolios and rubrics

- Catering and attending to individual differences: grouping, individualizing instruction, guidance and counseling, bridge courses, enrichment activities, Infrastructural support

Sessional Work

The following activities are only suggestive. The teacher educator can formulate more activities

Critical analysis of classroom instruction in the light of the understandings developed in Units 2 & 3

Any one experiment on learning – division of attention, memory, transfer of learning

Case study of a learner with behaviour problem/talented child/a LD child/a slow learner/a disadvantaged child

Study of intelligence of at least 5 school children and relating it with achievement and other background factors

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Semester III

Paper V: Teaching: Approaches and Strategies

Course Objectives

On completion of the course the student teacher will be able to

- demonstrate his/her understanding of the role of a teacher at different phases of instruction
- write instructional objectives for teaching of a topic
- demonstrate his/her understanding of different skills and their role in effective teaching
- use instructional skills effectively

Unit 1 Understanding Teaching

- Concept of Teaching and its relation to Learning
- Teaching as a planned activity – elements of planning for teaching
- Assumptions underlying teaching and their influence on teaching
- Proficiency in teaching: meaning; affecting factors: Knowledge, Skills, Competencies, teaching aptitude, teaching attitude, Experience and commitment
- The pedagogical and subject related skills and competencies required in teaching
- Impact of one's own socialization processes, awareness of one's own shifting identities as 'student', 'student teacher' , and their influences on 'becoming a teacher'
- Teacher's professional identity- Social status
- An analysis of teacher roles and functions in the three phases: pre-active phase – visualizing; decision-making on outcomes, preparing and organization; interactive phase - facilitating and managing learning; post-active phase – assessment of learning outcomes, reflecting on pre-active, interactive and post-active processes

Unit 2 Pre-active Phase of Teaching

- An analysis of teacher roles and functions in : pre-active phase – visualizing; decision-making on outcomes, preparing and organization
- Visualizing: the learner and learner readiness, characteristics, the subject matter content and their interlinkages, the learning resources, approaches/strategies
- Decision-making on outcomes: establishing general instructional goals, specification of objectives and standards for learning, allocation of instructional time for various activities/tasks – instructional time as a variable in learning
- Decision-making on instructional approaches and strategies: Expository or Inquiry, Individualized or Small Group or Whole Class – Skills required for learner engagement in the context of the strategy decided,
- Preparing for instruction: identifying and selecting available learning resources or developing required learning resource
- Preparation of Unit Plan and Lesson Plan

Unit 3: Interactive Phase of Teaching – Strategies of Teaching

- An analysis of teacher roles and functions in the interactive phase - facilitating and managing learning;
- Expository Strategy as approach to teaching for understanding: Presentation-discussion-demonstration, the Advance Organizer Model;
- Inquiry Strategy as approach to teaching thinking skills and construction of knowledge: Concept Attainment/ Concept Formation, Inductive Thinking, Problem Based Learning/Project Based Learning;

Unit 4: Interactive Phase of Teaching – Approaches and Skills of Teaching

- Approaches to Organizing Learning - Approaches to Individualized Instruction: Computer Managed Instruction, Programmed Instruction, and Learning Activity Packages;

- Approaches to Small Group and Whole Group Instruction: Cooperative and Collaborative approaches to learning, Brain storming, Role Play and Dramatization, Group Discussion, Simulation and Games, Debate, Quiz and Seminar, Blended approach to teaching-learning and scenario based teaching-learning
- Instructional Skills: Structuring, Soliciting and Reacting, Verbal and Non verbal, Feedback and Reinforcement, Discourse, Demonstration and Modeling, Techno pedagogic skills

Unit 5: Post-active Phase of Teaching

- An analysis of teacher roles and functions in the post-active phase: evaluation of pupil learning, evaluation and generating feedback on all three phases of teaching
- Evaluating teacher/ teaching effectiveness: Using learner achievement as a feedback and use of other Criteria.
- Reflection on appropriateness and sufficiency of planning and implementation activities of a teacher
- Reflection and appraisal for professional development in teaching: self-reflection, observation and feedback by peers, teachers Performance appraisal system
- Understanding teacher as a professional: expectations and responsibilities of a teacher, teacher as an autonomous functionary and a member of a community of professionals - balancing personal aspirations and professional pressures, developing an ‘identity’ as a teacher.

Sessional Work

Study of instructional practices with reference to use of classroom skills

Classification of instructional objectives of a lesson under domains and levels

Writing instructional objectives for different content categories

Identifying skills incorporated in a lesson plan and judging their appropriateness and adequacy

Practice of skills in a simulated situation

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Semester III& IV

Paper VI& VIII- Pedagogy of Mathematics

Course Objectives

This course is designed to enable pre-service senior secondary mathematics teachers to:

- develop understanding of curriculum in context through assessing students' work, mathematics problems and/or texts.
- develop understanding of teaching through analyzing classroom interactions and the interplay among mathematics, classroom tasks, teaching, and students' ways of thinking and learning.
- develop professional dispositions for teaching through the demonstration of professional attitudes and work habits as well as the identification of professional organizations and professional development resources.
- continue learning mathematics, especially in ways that promote inquiry and investigation.
- develop the own understanding of what mathematics is, how students learn mathematics, and how to analyze students' mathematical thinking,
- develop a repertoire of teaching strategies that is congruent with students' beliefs regarding mathematics,
- familiarize yourself with current curricular trends, and foster a community of learners that includes ALL students.
- describe national and state math goals/standards and the math reform movement, and explain how they influence today's math curriculum;
- list and use a variety of resources for teachers as professionals-organizations, web sites, publications, etc.
- prepare and present lesson and unit plans at different levels incorporating problem solving, and the use of manipulates and technology;
- prepare, explain, and use both traditional and alternative assessments;
- demonstrate the use of a variety of teaching and motivational strategies;

- observe and take part in hands-on teaching experiences as they arise either in class at the institute/ college or as field experience in a school.
- reflect on what they have learned from the course and how they hope to apply it in their future classroom.

Course Content

Unit 1: Curriculum of Senior Secondary School Mathematics

Curriculum reforms in senior secondary school mathematics and the paradigm shifts.

The curriculum of SSSM and its bases in NCFSE, 2005; the curriculum in terms of intended learning outcomes, content, modes of engagement and assessment, and the changes from the previous curriculum

The content and the processes in SSSM and their relationship

Strands of content and their logical organization-horizontal (within classes 11 and 12) and vertical (between classes 11 and 12), and linkages with secondary and tertiary mathematics; kinds content knowledge, structures of content and mathematical thinking

Integration of ICT with content and pedagogy

Comparison between national and the state curricula,

Need for standard- based curriculum

Comparison between the national SSSM curriculum and standard-based curriculum of other countries

The ‘implemented’ and the ‘assessed’ curriculum of SSSM and comparison with the intended curriculum

Unit 2: Strategies for Teaching of Different Kinds of Mathematical Knowledge

Teaching of Mathematical Concepts

Meaning and aspects of a concept, concept formation and concept assimilation, Moves in teaching a concept – defining, stating necessary and/or sufficient condition, giving example with/without a reason, Comparing and contrasting, giving counter example; non-example with/ without a reason; Use of Concept Attainment and Advance Organizer Models, planning and implementation of strategies in teaching a concept, Concept mapping.

Teaching of Mathematical Generalisations

Learning by Exposition: Moves in teaching for understanding of generalizations: Introduction moves – focus, objective, motivation; Assertion, Interpretation moves- instantiation, paraphrasing, review of prerequisites, translation, analogy, analysis; Justification, Application – planning of strategies for teaching generalizations.

Learning by discovery: Nature and purpose of learning by discovery, Inductive-, deductive – guided discovery strategies, Maxims for planning and conducting discovery strategies; planning of strategies involving either induction or deduction or both for constructing knowledge.

Unit 3: Teaching of Process in Mathematics

Teaching for Understanding Proof

Developing an intuition about the nature of proof – to make the transition from concrete thinking to more formal reasoning and abstract thinking, kinds of proof – direct proof, mathematical induction, proof by contradiction, proof by cases, the contra positive, and disproof by counter example, learning to develop reasoning, meta-cognitive/reflective skills

Teaching Problem Solving in Mathematics

Definition of a problem, problem-solving and teaching problem-solving; importance of teaching problem solving, posing a problem, generating problem, modeling and model for problem-solving in algebra and geometry, Situation model for solving word problem, discovering or exploring various options for solving the problem i.e. developing heuristics, carrying out the plan and generating and extending a good problem,

Unit 4: Assessment for, as and of Mathematics Learning

Stating measurable objectives of teaching concepts, generalizations, problem solving and proof; construction of appropriate test items for assessing product and developmental(thinking skills) outcomes, Diagnosing basic causes for difficulties in learning concepts, generalizations, problem solving and proof; planning remedial teaching strategies based on the perceived causes, implementing and evaluating the strategies.

Construction of unit tests: Design and blue print; item construction; marking scheme; question-wise analysis. Construction of a mathematics question paper including general instruction with nature of options and overall coverage, and marking scheme.

Unit 5: Teaching Mathematics for All

Characteristics of students of high ability and unsuccessful learners: Learning mathematics in groups-issues in practice, Group work and cooperative or collaborative strategies, instructional strategies in heterogeneous classrooms, use of supplementary learning resources, use of technology to meet diverse needs of learners, institutional programmes for gifted in mathematics.

Unit 5: Learning Resources in Mathematics

Meaning, types, functions, preparation and utilization of learning resources in Mathematics: Textbook, Models, Calculators and Computers, Graphic calculators, Logo in learning algebraic language and spatial reasoning, Cabri-geometry as a mediating and as a cognitive tool, Geometer's sketchpad, The

Mathematics Laboratory – planning and organizing lab activities, Mathematics Outside the Classroom

Pedagogical Analysis of Senior Secondary School Mathematics

We will revisit and explore the mathematics of senior secondary school curricula and examine the mathematics under the following strands from a pedagogical point of view.

1. **Number System** - Real number , Complex Number
2. **Algebra** - Sets, Relations, Functions, Trigonometric functions, Inverse functions, Mathematical Induction, Mathematical reasoning ,Linear Inequalities, Permutation and Combination, Binomial theorem, Sequences and Series (A.P., G.P.), Matrix and Determinants, Vector Algebra, Quadratic equations.
3. **Geometry** – Straight line, Conic Section, Two Dimensional , Three Dimensional Geometry
4. **Calculus** – Limit Continuity, Differentiability, Application of Derivatives, Integrals and Application of Integrals, Differential Equations.
5. **Probability and Statistics** - Mean , Measure of Dispersion, Mean Deviation , Standard Deviation , Analysis of Frequency Distribution , Probability, Conditional Probability, Independent Events, Bayes' Theorem , Random Variable and its probability distributions, Binomial Distributions.
6. **Linear Programming** - Formulation of Problem, kinds of linear programming Problems and Mathematical Modelling.

Sessional Work:

Selecting the content, knowing the content to teach the content through identifying the pedagogical content knowledge

Stating instructional objectives for a mathematics lesson and identifying learning outcomes

Designing learning activities, appropriate strategies; selecting/preparing learning resources; assessment techniques and tools, etc.

Preparing lesson plans and unit plans

Analysis of a Unit / Chapter in mathematics textbook to identify the concepts, principles and processes and to understand the underlying mathematical structures

Stating specific objectives of teaching items of knowledge and processes reflecting goals of secondary school mathematics

Critical analysis of moves and teaching skills used in a lesson taught in a class or in a lesson plan

Planning and implementation of appropriate strategies for teaching mathematical concepts and generalizations in simulated and real classroom situations

Construction of appropriate test items to assess outcomes of learning mathematics

Identification of learning difficulties experienced by students in a lesson and evaluation of the remedial strategies adopted by the teacher

Observation and analysis of strategies followed in teaching proof and problem-solving in mathematics

Preparation of at least a lesson plan based on each of the strategies of teaching proof, and problem solving and practice of the strategies in simulated/real classroom situations

Construction of a unit test, a diagnostic test and an achievement test in mathematics

Planning and implementation of remedial instructional strategies based on an analysis of students' responses to questions in a test

Development of a learning aid on a topic in mathematics and the procedure for using it

Case study of a gifted/ talented and an unsuccessful learner in the class

An appraisal of inservice programme for mathematics teachers organized by some nodal institutions in the area/region

Review of Articles -Self-chosen and assigned-and write a summary of the content, a reflection of your thoughts, questions, etc on the article, and describe any applications to your future teaching. The five self-chosen articles can be taken from Internet sites or professional publications such as *The Mathematics Teacher*.

Write a reflection on the course on what they have learned from the course and how they hope to apply it in their future classroom

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Periodicals

Educational Studies in Mathematics

International Journal of Science and Mathematics Education

Journal of Research in Mathematics

Journal of Mathematics Teacher Education

Mathematics Education Research Journal

Mathematics Teaching

Research in Mathematics Education

School Science and Mathematics

Teaching Children Mathematics

The Mathematics Teacher

Semester III and Semester IV

Paper VI & VIII- Pedagogy of Physics

Max. Marks 100

Sessional 30

70

Objectives

At the end of the completion of the course student teacher will develop

- capacity to understand the Physical concepts in their right dimensions
- attitude to perceive the Physical Phenomenon with care and concern
- skills to observe systematically purposively measure, record, analyze, physical data
- ability to preform experiments, demonstrate experiment
- ability to systematically verify the facts, relations and theories
- application for quantification, measurement, reduction and present in problem relations of variables

Unit – 1: Physics curriculum and instruction

The significance of physics curriculum of the higher secondary level, analysis of the various concepts and principles in physics, standards, International union of physics, PSSC, Howard physics project. Project classroom 2000+ Committees, Quality Council, Boards and National levels, Accelerated Science programme of ICASE, California physics instruction standards. Recent trends in physics curriculum, review and analysis.

Unit – 2: Teaching of Physical concepts and principles

Meaning of concept, its characteristics, concept formation, ways of assimilation, defining concepts, building relations of physical concepts comparing the variables in different dimensions, use of Burners ideas of use of concept attainment, planning and implementation of strategies that facilitate learning

and increase self-awareness, concept mapping. Models of Instruction inquiry model Ecological Models.

Unit – 3: Planning Instruction

Unit planning, its characteristics, planning lesson models in physics, Factors affecting lesson planning, planning and Design for example use of web Quest, Interfacing Direction instruction with on-line instruction. Facilitative planning providing more space and time for student participation and construction of knowledge, feedback, co-operation, collaboration Student Inquiry, sharing plans, and Critique, Micro instruction in simulation – Role play, Questioning, managing student response, directing, encouraging students for participation, web-posting by students, (with social media technology- use of Picassa for sharing pictures of instruction) various use of resources, (chatting, questioning, sharing, use of Blogs, use of multimedia such as SMS for sharing).

Unit – 4: Teaching Processes in Physics

The process of induction, reasoning, analysis, facilitating inquiry, process skills, problem solving, scaffolding, cognitive mapping, unit analysis, point analysis co-ordinate mapping, graphing, animation, virtual experimentation, analysis, verification various methods- involves hypothesizing, analysis, verification, justification, inference, principles, laws, use of mathematics as a language and dimensional analysis of grammar for physics, increase relation between physics, technology and society.

Unit – 5: Assessment for, as and of physics learning

Starting measurable objectives of concepts, principles, process, problems in physics, construction of appropriate test items for assessing product and developmental (thinking skills) outcomes, diagnosing the causes for difficulties in learning concepts, process, understanding problems, generalisation, planning remedial teaching strategies, implementing evaluation strategies.

Construction of Unit tests: Design and blue print; item construction; marking scheme: question wise analysis. Construction of question paper in physics with

clear general instructions on option and overall coverage and marking scheme preparing question bank in physics.

Unit –6: Learning Resources in physics

Meaning, types, functions, preparation and utilizations of learning resources in physics: preparation of teaching aids and improvising instrument, Text book, Work book, Journals, Models graphics development of (CDs, Videos, computer animation) use of mobile technology, organization of physics laboratory, instrumentations supply, storage and maintenance, safety precautions, rules and regulation, laboratory programme – list of laboratory activities of recommended experiments, project work.

Pedagogical Analysis of Higher Secondary School Physics

The procedural knowledge in the selected units could be used for the practicum; Activities, problems and discussion points of devote to result in presentation as charts, maps, web sites experiments, and activities for more co-operative and collaborative learning with active participation and continuous self-evaluation by students

Unit – 1: Physics, Technology and Society

Fundamental forces in nature, Gravitational force, Electromagnetic force, Strong nuclear force, weak nuclear force devote on towards unification of forces.

Unit – 2: Units and Measurement

International system of units, measurement of length, estimation of very small distances: size of a molecule, measurement of mass and range of masses, measurement of time, accuracy, precision of instruments, errors in measurement – various types of errors. Dimensional analysis and its applications. Deducing relation among the physical quantities.

Unit – 3: Motion in straight line and motion as phase

Rectilinear motion, Kirematis, Uniform motion, Average velocity, acceleration, kirematis equations for uniformly accelerated motion, relative velocity.

Sector and vector, position and displacement vectors, Addition, subtraction, multiplication and resolutions of vectors- various methods (Graphical, analytical method), position vector and displacement, velocity, acceleration, projective motion, uniform circular motion, centripetal acceleration.

Unit – 4: Terms of Motion

The law of inertia, Newton's First law of motion, second law of motion, (momentum), third law of motion, conservation of momentum, common forces in mechanics.

Unit – 5: Work, Energy and Power

Potential energy, kinetic energy, work energy, theorem for as variable force, law of conservation of energy-hest, chemical energy, electrical energy, equivalence of mass and energy, nuclear energy. Collisions in one and two dimension.

Unit – 6: Systems of particles and Rotational motion

Internal and external forces, momentum of a system of particles, angular velocity, acceleration the conservation, kinemstion of Rotational motion, conservation of angular momentum, kinetic energy of rolling motion

Unit – 7: Gravitation

Keplers laws, acceleration due to gravity, rotational energy escape speed, energy of as ges-stationery and polar satellites, weightlessness (zero gravity)

Unit – 8: Mechanical properties of solids and fluids

Hookes law, elastic foharious of materials, Bernoulli's frincifle, viscosity, Reynolds number, Surface tension.

Unit – 9: Thermodynamics

Temperature and heat, ideal gas equation, thermal expansion, calorimetry Newton's law of cooling, zeroth law of thermodynamics, heat, internal energy and work, first law of thermodynamics, thermodynamics process, second law of thermodynamics reversible and irreversible process.

Unit – 10: Kinetic theory, oscillation waves

Kinetic theory of an ideal gas, specific heat capacity, periodic and oscillatory motions, simple harmonic motion, its velocity and acceleration, Force law, Energy Forced oscillations and resonance Transverse and longitudinal waves displacement relation in on progressive wave, speed of wave, its superposition, reflection of waves, Doppler effect.

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<http://www.unitplanning.com> It costs \$400/- for loading the website. It is for sale also for \$400/- by a single user at one time.

Resources for Teachers –Community Resources for Science
<http://www.crsceience.org/resources> for teachers

Free classroom lesson plans and unit plans for teachers
<http://www.sholastic.com/teachers/lessonplans/free-lessonplans>

How to write a unit plan 8 steps-wikihow
<http://www.wikihow.com/Teacherresources>

BBC-Schools-Teachers-Bang goes the theory: Lesson plan 9

<http://www.bbc.co.uk/schoolsHome/Teachers/BanggoestheTheory>

Video clips from the lesson plan 'conservation of mass in chemical reactions' for use in 11-14 science lessons.

Lesson plan 10-ABC

http://www.abc.net.au/science/surfingscientist/pdf/lesson_plan16.pdf

Lesson plan in Chemistry – lesson.webcrawler.com/ search for lesson plan in chemistry with 100's of results at web crawler.

A lesson plan in chemistry phases of matter-slide share
<http://www.slideshare.net/.../a-lesson-plan-in-chemistry-phases-of-matter-9560...> Oct 5,2011

High school (Grades 9-12) Chemistry activities, Lesson plans...
<http://www.sharemylesson.com/high-school-chemistry-teaching-resources/> (these are provided free on proper request and authentication)

EDUC331Chemistry Lesson plan GoBookee.youtube,Go bookee.org

School wires, States of Matter, School District BHSD 228

<http://bhsd228.schoolwires.net/cms/lib6/ILO>

[1001099/centricity/domain/12/ubD_States_of_Matter.pdf](http://www.apsva.us/cms/lib2/VAO1000586/centricity/Domain/75/Earth)

<http://www.apsva.us/cms/lib2/VAO1000586/centricity/Domain/75/Earth>
[Science Curriculum/Unit 4 UBD.pdf](#)

Curriculum Bulletin Grade 10

Chemistry,<http://www.fpsct.org/uploaded/documents/october252002.pdf>

The new Chem Source Source Book v.3.0, Source View and User Guide v.3.0
Guide Book, p.7

<http://www.about.com>,

<http://www.rsc.com>,<http://www.iupac.com>,<http://unesco.com>.

Rgunhold,Sondra,C, Jonathan,E.Lillian,May and et.al.(eds.) in How to write a
unit plan <http://www.wikihow> unit planning.com

Semester III & IV
Paper VI & VIII Pedagogy of Chemistry

Max Marks 100

Sessional 30

70

Objectives

At the end of the completion of the Course student teacher will develop:

- ability to comprehend the nature, structure of chemical substances and its properties
- strategies to use various models, approaches and techniques of teaching
- skills to observe, manipulate, measure, record, analyze chemical relations and verify chemical relation and theories
- appreciation for quantification, quantitative and qualitative analysis
- facilitate problem solving and analysis
- Evaluate the processes and critique.

Unit – 1 Teaching Chemistry concepts

Meaning of concept, its characteristics, concept formation, ways of assimilation, defining concepts, understanding relationship between elements and compounds, importance of structure of chemical substance, its properties : physical and chemical, strategies of understanding chemical concepts, teaching chemistry in different settings – laboratory, field experiments, mobile chemistry experiments

Unit – 2 Understanding Chemistry

IUPAC nomenclature Red and Blue book. Reforms in chemistry curriculum, CHEM study, Study of concepts and its organization, strategies of facilitative learning models- constructivist models : Bruner, Piaget, Gagne. Micro approach to molecular understanding. Various approaches of teaching chemistry: Inductive approach, deductive approach, integrated approach, Ecological approach, Science, Technology and Society approach, Systems approach, Micro approach, Mastery learning approach.

Unit – 3 Planning Instruction

Unit planning -its characteristics, planning lesson models in chemistry, factors affecting lesson planning and design. For example use of web- quest, interfacing direction, instruction with on-line instruction, facilitative planning – enhancing student participation, construction of knowledge, feedback, co-operation, collaboration, student inquiry, showing plans and critique, micro instruction in simulation, Role play, use of social media's technology for posting instructional pictures (using processes) chem draw, chem sense, use of internet for chatting and messaging.

Unit -4 Assessment for, as and of chemistry learning

Stating measurable objective of concepts, principles, processes, problems in Chemistry, Construction of appropriate test items for assessing product and developmental (thinking skills) outcomes, diagnosing the Courses for difficulties in learning concepts, process, understanding problems, generalizations, planning remedial teaching strategies, implementing evaluation strategies.

Construction of unit tests: Design and blue print; item construction, marking scheme, question-wise analysis, construction of question paper in chemistry with clear general instruction on option and overall coverage and marking scheme of preparing question bank in chemistry.

Unit – 5 Learning Resources in Chemistry

Meaning, types, functions, preparation, utilization of learning, resources in chemistry. Preparation of teaching aids and improvising instrument, including use of online and open sources, text-book, work-book, journals, models, use of graphics, development of C.Ds, videos, computer animation, use of mobile technology, organization of chemistry laboratory instrumentation – supply storage and maintenance, chemicals and reagents, their procurement, preservation and appropriate use, safety precautions, rules and regulation, laboratory programme – list of laboratory activities of recommended experiments, project work.

Pedagogical Analysis of Higher Secondary School Chemistry

Unit – 1: Basis Concepts in Chemistry, classification of Elements, Chemical Bonding and Molecular structure

Matter and its nature, laws of chemical combinations, Dalton's Atomic Theory, Atomic and molecular masses, mole concept and molar masses, stoichiometry
Atomic models-Bohr's model of atom, Hydrogen atom, Bohr's series, Quantum mechanical model of atom

Modern periodic classification of elements, (IUPAC 2005 version), electronic configurations and types of elements: s,p,d,f blocks, periodic trends in properties of elements.

Chemical bonding and Molecular structure Kossel – Lewis approach to chemical bonding, atomic bond, bond parameters, VSEPR theory, valence bond theory, Hybridization – sp, sp², sp³, molecular orbital theory, bonding in some molecular diatomic and molecular hydrogen bonding.

Unit – 2: States of Matter and Thermodynamics gaseous state

Inter molecular forces vs thermal interactions,

Gaseous state– gas laws, ideal gas, equation, kinetic molecular theory of gases, behaviors of real gases – deviation from ideal gas behavior, liquefaction of gases, liquid state

Thermodynamics – thermodynamics state- its applications, measurement of ΔU and ΔH : calorimetric Enthalpy change, ΔH of Reaction, Enthalpies for different types of reactions, spontaneity, Gibbs Energy change and Equilibrium
Solid State- Crystalline Solids- its types, unit cell, close packed structure imperfections in solids, electrical and magnetic properties.

Type of solution, solubility, vapour pressure of liquid, ideal and non ideal solutions, colligative properties and determination of molar mass, abnormal molar masses.

Equilibrium in physical processes, dynamic equilibrium, law of chemical equilibrium and equilibrium constant, homogeneous equilibrium, heterogeneous

equilibrium, applications of equilibrium constants, relationship between equilibrium constants K , reaction quotient Q and Gibbs energy G for factors affecting equilibrium, some equilibrium in solution, Acids, Bases and salts, buffer solution, solubility equilibrium of sparingly soluble salts.

Unit – 3: Electro Chemistry

Electro chemical cells, Galvanic cells, Nernst equation, conductance of electrolytic solutions, electrochemical cells and electrolysis, batteries – its types, fuel, corrosion

Unit – 4: Chemical Equilibrium Kinetics and surface chemistry

Equilibrium – Equilibrium in Physical process, dynamic equilibrium, law of chemical Equilibrium and Equilibrium constant, Homogeneous Equilibrium, heterogeneous Equilibrium application of Equilibrium constants, relationship between Equilibrium Constant K reaction Quotient Q and Gibbs Energy G for factors affecting Equilibrium ionic Equilibrium in solution, acids, bases and salts, Buffer solutions, solubility Equilibrium of sparingly soluble salts.

Rate of chemical reaction, factors influencing rate of a reaction, collision theory of chemical reactions

Absorption, catalysis, colloids, its classification, emulsions, colloids around us.

Unit – 5: Methodology of Methods

Occurrence, concentration of elements, extraction of metals thermodynamic principles and electrochemical principles refining uses of Aluminum, copper, zinc and iron

Coordination compounds – Werner's theory, nomenclature, coordination bonding in coordination compounds, bonding in metal carbonyls, properties of coordination compounds, importance and applications of coordination compounds,

Unit – 6: The P-Block Elements, d and f block elements

Group 15 elements, Dinitrogen, Ammonia, oxides of Nitrogen, Nitric acid, Phosphorus allotropic forms, phosphine, phosphorus halides, oxo acid of phosphorus.

Group 16 element, dioxygen simple oxides, argon, sulphur-allotropic forms, Sulphuric acid sulphur, sulphuric acid

Group 17 element –chlorine, Hydrogen chloride, oxo acids of Halogens, inter halogen compounds,

Group 18 element, electronic configurations of d-block elements, its general properties, some important compounds of transition elements, lanthanides, Actinoids, their applications

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Bodner, G.M., Hunter, et al. Designing and implementing a constructivist chemistry laboratory –

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Chemistry Part II, Text book for class XI New Delhi: NCERT, 2006

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Physics Part I, Text book for class XI New Delhi: NCERT, 2006

Physics Part II, Text book for class XI New Delhi: NCERT, 2006

Physics Part II, Text book for class XII New Delhi: NCERT, 2007

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<http://www.unitplanning.com> It costs \$400/- for loading the website. It is for sale also for \$400/- by a single user at one time.

Resources for Teachers –Community Resources for Science
[http://www.crs-science.org/resources for teachers](http://www.crs-science.org/resources-for-teachers)

Free classroom lesson plans and unit plans for teachers
[http://www.sholastic.com/teachers/lesson plans/free-lesson plans](http://www.sholastic.com/teachers/lesson-plans/free-lesson-plans)

How to write a unit plan 8 steps-wikihow
[http://www.wikihow.com>...>Teacher resources>](http://www.wikihow.com/Teacher-resources)

BBC-Schools-Teachers-Bang goes the theory: Lesson plan 9
[http://www.bbc.co.uk>schoolsHome>Teachers>Bang goes the Theory.](http://www.bbc.co.uk/schools/Home/Teachers/Bang-goes-the-Theory)

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Lesson plan 10-ABC

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2007/ABC Science online. Lesson plan 16 cool chemistry DIY pH Indicator. Brief description .Red cabbage juice is a natural pH indicator making this classic.

Chemistry <http://www.ask.com/chemistry>

Lesson plan in Chemistry – lesson.webcrawler.com/ search for lesson plan in chemistry with 100's of results at web crawler.

Chemistry Lesson plans

[http://www.chemistry.about.com>Education>Chemistry>General chemistry](http://www.chemistry.about.com/Education/Chemistry/General-chemistry)

Unit plan for the periodic table <http://www.umanitoba.ca/.../S1-2%20-%20chemistry%20and%20periodic%20...>

A lesson plan in chemistry phases of matter-slide share
<http://www.slideshare.net/.../a-lesson-plan-in-chemistry-phases-of-matter-9560...> Oct 5, 2011

High school (Grades 9-12) Chemistry activities, Lesson plans...
<http://www.sharemylesson.com/high-school-chemistry-teaching-resources/> (these are provided free on proper request and authentication)

EDUC331Chemistry Lesson plan GoBookee.youtube,Go bookee.org

School wires, States of Matter, School District BHSD 228

<http://bhsd228.schoolwires.net/cms/lib6/ILO>

1001099/centricity/domain/12/ubD_States_of_Matter.pdf

<http://www.chemistryunitplanning.com>

Chemistry –unit-planning.wikispaces.com

It covers unit SCH4U- Organic Chemistry

To do activities: 1. Activity 1 Molecular modeling, Teacher notes

2. Activity 2 Molecular modeling, Lesson plan

3. Misconceptions

4. Summative Unit test with analysis

<http://www.apsva.us/cms/lib2/VAO1000586/centricity/Domain/75/Earth>

Science Curriculum/Unit 4 UBD.pdf

Curriculum Bulletin Grade 10

Chemistry,http://www.fpsct.org/uploaded/documents/october_252002.pdf

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Guide Book, p.7

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Optical Isomerism – Chemguide

www.chemguide.co.uk/basic/isorism/optical.html.

Definitions: optical Isomers – the Chemical Education Digital Library

www.chemeddl.org/collections/stereochem/definitions.htm.

Chemistry (Chemistry), Wikipedia's, [Wikipedia.org/wiki/chemistry-\(chemistry\)](http://Wikipedia.org/wiki/chemistry-(chemistry))

Optical isomers

www.chem.purdue.edu/ofchelp/cchem/optical.html.

Optical isomers

www.chm.bris.ac.uk/motm/thelomide/opticalisa.html.

Optical Isomers definitions

Chemistry about.com

Semester IV

Paper VII: Learning Assessment

Course Objectives:

The student teachers will be able to

- understand the nature of assessment and evaluation and their role in teaching-learning process.
- understand the perspectives of different schools of learning on learning assessment
- realise the need for school based and authentic assessment
- examine the contextual roles of different forms of assessment in schools
- understand the different dimensions of learning and the related assessment procedures, tools and techniques
- develop assessment tasks and tools to assess learners performance
- analyse, manage, and interpret assessment data
- analyse the reporting procedures of learners performance in schools
- develop indicators to assess learners performance on different types of tasks
- examine the issues and concerns of assessment and evaluation practices in schools
- understand the policy perspectives on examinations and evaluation and their implementation practices
- traces the technology bases assessment practices and other trends at the international level

Unit 1: Perspectives on Assessment and Evaluation

- Meaning of Assessment, Measurement, Tests, Examination, Appraisal, and Evaluation and their interrelationships
- Principles of assessment and evaluation,
- Paradigm shift in assessment based on different learning theories

- Purposes of Assessment: Prognostic, Monitoring of Learning, Providing Feedback, Promotion, Placement, Certification, Grading and Diagnostic
- Classification of assessment: based on purpose (prognostic, formative, diagnostic and summative) scope (teacher made, standardized), attribute measured (achievement, aptitude, attitude, etc.), nature of information gathered (qualitative, quantitative), mode of response (oral and written; selection and supply), nature of interpretation (norm referenced, criterion referenced) and context (internal, external)
- Continuous and comprehensive evaluation
- School based assessment; Authentic assessment

Unit 2: Assessment for and as Learning

- Meaning of assessment for learning and as learning. Metacognition and development – need for continuous, formative and diagnostic assessment
- Assessment Tools- Use of Projects, Assignments, Work sheets, Practical work, Performance based activities, Seminars and Reports
- Developing Performance Tasks (Subject Specific)
- Assessment of Group Processes - Collaborative/Cooperative Learning and Social skills
- Portfolio Assessment – its meaning, scope and uses; Planning, development and assessment
- Self, Peer and Teacher Assessments

Unit 3: Assessment of Learning

- Dimensions of learning: cognitive, affective and performance
- Assessment of cognitive learning: types and levels of cognitive learning: understanding and application; thinking skills – convergent, divergent, critical, problem solving, and decision making; items and procedures for their assessment

- Assessment of affective learning: attitude and values, interest, self-concept; items and procedures for their assessment
- Assessment of Performance: tools and techniques for assessment of skills
- Grading: Concept, Types and Application: indicators for grading; CBSE and State evolved indicators

Unit 4: Planning, Construction, Implementation and Reporting of assessment

- Consideration of what and why to assess (content and objectives)
- Differentiation between instructional, learning and assessment objectives
- Stating of Assessment Objectives - Need for integrated objectives.
- Deciding on the nature and form of assessment - oral tests and written tests; open book examination; weightage to content, objectives, allocation of time; Preparation of a blue print
- Construction/selection of items; Guidelines for construction of test items-different types –multiple choice/multiple response, short answer, very short answer and essay type, items for open book examination
- Construction of a question paper, scheme of evaluation
- Scoring procedure – manual and electronic; Development of Rubrics
- Analysis and Interpretation of Students' Performance
- Processing test performance: interpreting performance-for diagnosis and for classification
- Ascertaining student needs, identifying student interests and feeding forward for improving learning
- Reporting Student Performance – content and formats; Progress reports, Cumulative records, Profiles, and Open house

- Role of Feedback in Improving Learning, and Learners' Development- students, parents, and administrators; Use of Feedback for teachers' self-improvement

Unit 5: Issues, Concerns and Trends in Assessment and Evaluation

- Existing Practices: Unit tests, half- yearly and annual examinations, semester system, Board examinations and Entrance tests, State and National achievement surveys
- Management of assessment and examinations, Use of question bank
- Issues and Problems: Marking Vs Grading, Non-detention policy, Objectivity Vs Subjectivity, Impact of entrance test and public examination on teaching and learning – the menace of coaching
- Policy perspectives on examinations and evaluation: Recommendations in National Policies of Education and curriculum frameworks
- Trends in assessment and evaluation: Online examination, Computer-based examination and other technology based examinations
- Standards based assessment – international practices

Sessional Work

Planning of an achievement test

Planning of other assessment tools

School visits followed by presentation on evaluation practices in schools

Data processing and interpretation of any achievement test of school students

Presentation of papers on issues and concerns / trends in assessment and evaluation

Presentation of papers on examination and evaluation policies

One sessional test

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- Ward & Ward (2007) Assessment in classrooms.

Semester V

Paper –IX: Classroom Organization and Management

Course Objectives

To enable students to

- understand importance of classroom management
- describe approaches to classroom management
- understand ways of preventing problems in managing a classroom
- list physical resources and describe how to maintain them
- explain the role of teachers and the principal in ensuring a vibrant school climate

Unit 1 Classroom Organisation

- Meaning of classroom organization – purposes. Concepts of: smart classroom, distributed classroom, virtual classroom
- Organization of Space and learning resources; Display area and chalk/white board – other facilities such as projectors-OHP/LCD and Information and Communication Technology (ICT) in a classroom,
- Characteristics of School climate – conducive, learner friendly, inclusive, vibrant; Relation between school policy and school climate

Unit 2 Physical Facilities

- Physical resources in a school - physical space (building) with adequate classroom space, adequate furniture, learning resources such as the labs, library, sports field, and staff rooms, rest rooms, etc
- Management of physical resources - Maintenance, Optimum utilization with an intent or schedule
- Streamlining ways of using the facilities: coordination, sharing

Unit 3 School Environment- Teacher Role

- School as an institution with an environment of its own
- Leadership style of the headmaster and its influence on teacher role performance
- Visualize the requirements- procure, maintain and replenish with support of authorities
- Teacher self assessment and accountability – importance of feedback
- Factors affecting school environment - goodwill, acceptance, belongingness, openness, orderliness, and access, both among teachers and between teachers and students
- Promoting self-esteem among students
- Team work and transparency in functioning among teachers

Unit 4 Classroom Management

- Classroom management – concept, need and approaches
- Roles of students in a classroom – leader, follower and non participant
- Role of a teacher in classroom management – relationship between leadership styles of a teacher and classroom discipline
- Managing behavior problems in a classroom – Preventative, Supportive and Corrective. Common mistakes in classroom behavior management. Establishment of routines, rules and procedures
- Punishment and its legal implications – the rights of a child
- Time management in a classroom – allocated time versus engaged time

Unit 5 Mechanisms for coordinated functioning in school

- Planning: annual and long term; annual school calendar
- Day to day schedules- time table, notifications, announcements
- Monitoring for coordinated functioning: allotment, autonomy and accountability (internal and external)

- Collaborating; Staff Meetings: forum for sharing, review and further planning
- Regular, documentation of events and activities,
- Professional Learning communities (Online Communities) for teacher development
- Mechanisms that promote good relationship of school and teacher with parents and community.

Sessional Work

Practice of various approaches to classroom management in simulated group work

Through small group work find out the various school systems in India and their relevance of the varied school systems

Review the school time-table planning and its effectiveness towards attaining academic expectations laid by National Curriculum Framework
Preparation of a plan of action to be implemented during the next three years for improving a functioning of school

Project work on analyzing good and weak points of school management in private, Government, large sized and small sized classroom

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Semester V
Ed-Internship

Practical & Field Based Experiences (Initiatory Institutional Experiences)

Max. Marks: 300

Field experiences are an important component of the M.Sc. B.Ed Programme as they will provide opportunities to reflect on, validate practical applications of course contents as well as to function as a teacher in the School environment.

The candidates participate in the minimum of 300 hours of field experience during 5th semester prior to full time practice teaching in the final semester.

OBJECTIVES

This course intent to provide opportunities for student - teachers to:

- Develop conceptual understanding about linkages between theory and practice in general
- Apply in the school the theories and practices related to teaching and learning suggested in the foundation and pedagogy courses and to gain valuable initial teaching experience
- Develop understandings on the linkages between Secondary and Sec. Secondary curriculum and within Senior Secondary curriculum.
- To observe a variety of teaching practices develop individual teaching skills and to initiate professional relationships with master teachers and other school staff.
- Understand and develop meaningful learning sequences appropriate to the specificity of different levels of learning and mobilize appropriate resources for them.

During the field experience the students will work on the following tasks and submit practicum based assignment like reflective journals for each task at the end of the course.

Task Set 1 Initiatory Experiences

Reflections on one’s own School Experiences

Identifying Nurturants and Deterrents

Creating a ‘Big Picture’

Task Set 2 Recognise School as an ‘organised’ Endeavour

Functioning within a ‘structure’ with defined roles and responsibilities

Internal arrangements for coordinated functioning-time table, work allocation, differential responsibilities, planning and coordination procedures

External liaison – with parents, community, authorities.

Task Set 3 School as an ‘Enabling Learning Environment’

What ‘enables’ learning in schools?

Nature of school environment;

Learner perceptions; teacher perceptions; parental/community perceptions

Nature of inter relationships between and among learners-teachers; teachers; teacher- principal; parents-school; office-teachers-learners

Nature of ‘impact’ generated in school

Task Set 4 Classroom as a Learning Site

Kinds, modalities, learning resources used, student reactions and any relevant related points

Task Set 5 Design Learning Sequences in the school subject concerned with all the details required; draw upon from the other earlier courses of study

Assessment of this course shall be done internally by

Semester VI

Ed- Project / Dissertation

Review of Researches in the Subject (Physics)

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