

**Bachelor of Arts and Bachelor of Education
Chhindwara University, Chhindwara (M.P)**

COURSE OF STUDIES

For

Four Year Integrated

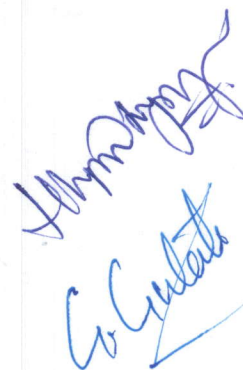
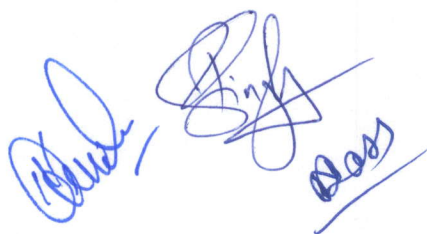
B.Sc. B.Ed (Eight Semester) Course

FOURTH SEMESTER

Subject/Paper	Paper	Intern.	Total	Pds./week
B.Sc Part: Foundation Course	40	10	50	3
Comp. & ICT in Education	40	10	50	3
Language - Hindi	40	10	50	3
English	40	10	50	3
Environmental Education				
Elective I +Practical	60+25	15+25	100	9
Elective II +Practical	60+25	15+25	100	9
Elective III +Practical	60+25	15+25	100	9
Total	415	160	500	
B.Ed Part	40	10	50	3
Inclusive Education				
Assessment for learning	40	10	50	3
Total	80	20	100	
Grand Total	495	180	600	

- Elective 1 – Physics/Botany
- Elective 2 – Chemistry
- Elective 3 – Zoology/Mathematics

(All the elective will have one theory paper and external practical examination except Mathematics where there will be two theory papers and practicum which will be valued internally)


Co-ordinator

Semester Name	Paper	Mark	Paper Code	Name of Papers
IV	Paper Theory-VII	30	M-4.1	Elements of Groups And Rings
	Paper Theory-VIII	30	M-4.2	Mechanics
	Internal Test	15		Related To Above Papers
	Practicum	25		Related to Above Papers

B.Sc. Component:

Foundation Course: Computers & ICT in Education – II

Contact Periods/week: 03

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives: On completion of this course, the student teachers will be able to:

- Explain the role of ICT in authentic and alternative assessment.
- Develop e-portfolio and assessment e-niches.
- Understand the social, economic, security and ethical issues associated with the use of ICT.
- Appreciate the scope of ICT for improving the personal productivity and professional competencies.
- Demonstrate the use of web conferencing/teleconferencing tools and technologies.
- Appreciate the use of ICT in improving educational administration.
- Explain the emerging trends in information and communication technology.
- Use ICT for self-directed professional development.

Unit I: ICT for Assessment

- ICT and Assessment
 - Electronic assessment portfolio – Concept and types; e-portfolio tools
 - Creation and use of electronic rubrics for assessment
 - Online and offline assessment tools – Rubrics, survey tools, puzzle makers, test generators, reflective journal, question bank
 - ICT applications for Continuous and Comprehensive Evaluation (CCE)

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UNIT II – ICT and Management

- National ICT policies, curriculum and schemes, ICT@Schools, NME-ICT
- Educational technology standards – UNESCO, JSTE, CEMCA and AECT
- ICT for personal management: e-mail, task, events, diary, networking
- ICT for educational administration: Scheduling, record-keeping, student information, electronic grade book, connecting with parents and community
- Managing the ICT Infrastructure: Software installation, troubleshooting of hardware, seeking and providing help, storage and backup, updating and upgrading software

Unit III: ICT for Professional Development

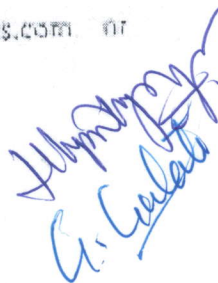
- ICT for professional development: Tools and opportunities
- Electronic teaching portfolio- Concept, types, tools; portfolio as a reflective tool for professional development
- Role of ICT in Self-directed professional development
- Professional development: Role of teleconferencing, EDUSAT- the Indian experiment; web conferencing tools and techniques
- Technology and design based research: Pedagogical implications for professional development

Unit IV: Emerging Trends in ICT Applications

- Pedagogy for e-books and rhizomatic learning
- Innovative pedagogy: Learning design informed by analytics
- Seamless learning – Role of mobile technology
- Ubiquitous computing and its educational promises
- Game based learning and one-to-one computing
- 3-D printing and its educational promises
- Social media for pedagogical innovations
- Threshold concepts and pedagogical applications
- Dynamic Assessment based Pedagogical Practices

Sessional Work

- Creating account in wikispace/Tikipedia/mediawiki and adding/editing content
- Developing an educational blog in www.blogger.com, www.wordpress.com or www.edublog.com



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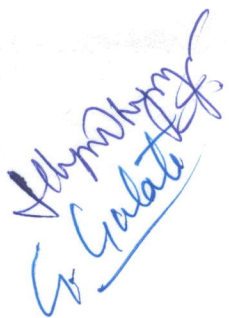
- LMS experience- hands on various features of LMS - the ICT course may be provided through LMS
- Evaluation of RLO repositories and creating RLO and uploading to repositories
- A critical study of some e-learning courses and enrolling and completing some free e learning courses
- Field visit to the EDUSAT center and take part in teleconferencing
- Planning and creating digital rubrics for any topic
- Organize web conferencing using Skype/Yahoo Messenger/Google+
- Review of ICT labs (plans and equipments/resources) in school from internet
- Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
- Developing an electronic assessment portfolio
- Developing an electronic teaching portfolio
- Readings on emerging ICT trends in education
- Review of national ICT policy and curriculum
- Using FOSS tools for timeblinking, grade sheet
- Creating social bookmarking account and creating social bookmarking of internet resources using any social bookmarking tools (digo, delicious, stumbleupon, Shelfari)

Suggested readings:

- Andrew A Kling(2010). Web 2.0 (Technology 360). Laxcent Books: New Delhi.
- Athanassios Jimoyiannis (Editor) (2011). Research on e-Learning and ICT in Education. Springer: USA
- Barbara B. Levin, Lyane Schrum.(2012). Leading Technology-Rich Schools (Technology & Education, Connections (Tee). Teachers College press: New York
- Bruce M. Whitehead, Devon Jensen, Floyd A. Bosehee.(2013). Planning for Technology: A Guide for School Administrators, Technology Coordinators, and Curriculum Leaders. Corwin: New Delhi
- Cambridge, D.(2010). E-Portfolios for Lifelong Learning and Assessment John Wiley and Sons
- Costantino, P.M., DeLorenzo, M.N., Kobrinski, E.J.(2006). Developing a professional teaching portfolio: a guide for success. Pearson





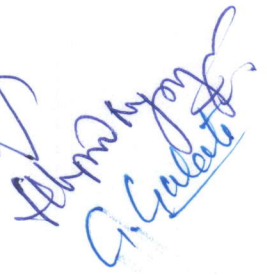



- EdD L. Robert Furman (2012). Instructional Technology Tools: A Professional Development Plan
- Foster, B.R., Walker, M.L., Song, K.H. (2006) A beginning teaching portfolio handbook: documenting and reflecting on your professional growth and abilities. Prentice Hall
- Imison, T., Taylor, P.H. (2001). Managing ICT in the Secondary Schools. Heinemann: Oxford
- Jean-Eric Pelet (2014). E-Learning 2.0 Technologies and Web Applications in Higher Education (Advances in Higher Education and Professional Development (Ahepd)). Idea Group: U.S.
- Laxman Mohanty, Neeharika Vora (2008). ICT strategies for schools- a guide for school administrators. Sage Publications: New Delhi.
- Lynne Schrum, Barbara B. Levin. (2010) Leading 21st-Century Schools: Harnessing Technology for Engagement and Achievement. Corwin: New Delhi
- Mangl Kumar Dahi (2010). ICT in teacher development. Neel Kamal Publications: New Delhi.
- MHRD-GOI (2004 and revised 2010) National ICT @ Schools Scheme. Department of School Education and literacy, MHRD, Govt. of India, New Delhi
- MHRD-GOI (2012) National Mission on Education through ICTs NME-ICT, Department of Higher Education, MHRD, Govt. of India, New Delhi
- MHRD-GOI (2012) National ICT Policy for School Education, Department of School Education and literacy, MHRD, Govt. of India, New Delhi
- Mary Webb and Margaret Cox (2014). Information and Communication Technology- Assessment for Learning in the ICT Classroom (Inside the Black Box). Learning Sciences: US.
- Michael Thomas (2009). Handbook of Research on Web 2.0 and Second Language Learning. Information Science Reference: US.
- Mishra, S. (Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU: New Delhi.
Available at
http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/STRIDE_Hb8_index.html
- Mohit K (2003). Design and implementation of Web-enabled Teaching Tools: IRM Press UK









- Montgomery, K., Wiley, D.A. (2004). Creating E-portfolio using powerpoint- A Guide for Educators. Sage New Delhi
- Pradeep Kumar (2011). Web Resources in Pedagogy. Apple Academics; Oakville
- Renann Phelps, Anne Graham. (2013). Technology Together: Whole-School Professional Development for Capability and Confidence. ISTE: USA
- Rena M. Palloff, Keith Pratt (2011). The Excellent Online Instructor: Strategies for Professional Development. Wiley: San Francisco
- Ronghui Huang, Kinshuk, Jon K. Price (Editor) (2014) ICT in Education in Global Context: Emerging Trends Report 2013-2014 (Lecture Notes in Educational Technology). Springer: USA
- Rosemary Papa. (2010). Technology Leadership for School Improvement. Sage New Delhi.
- Semenov, Alexy (2005). Information and Communication Technologies in Schools A handbook for Teachers. UNESCO
- Sonny Magana, Robert J. Marzano (2013). Enhancing the Art & Science of Teaching With Technology (Classroom Strategies)
- Steven W. Anderson, Deborah Siegel. (2014). The Tech-Savvy Administrator: How do I use technology to be a better school leader? ASCD
- Theodore Lee (2008). Professional Development of ICT Integration for Teachers. VDM Verlag: Germany.
- UNESCO. (2001). UNESCO Report: Teacher Education Through Distance Learning: Technology- Curriculum - Cost - Evaluation. UNESCO.
- UNESCO. (2007). UNESCO Report: Information and Communication Technologies in Teacher Education, A Planning Guide, Division of Higher Education, UNESCO.
- UNESCO. (2007). UNESCO Report: Information and Communication Technology in Teacher Education. A Curriculum for Schools and Programme of Teacher Development. Division of Higher Education, UNESCO.
- UNESCO, Bangkok. (2005). Final Report. Building Capacity of Teachers/Facilitators in Technology-Pedagogy Integration for Improved Teaching and Learning. Bangkok, Thailand. June 18-20.

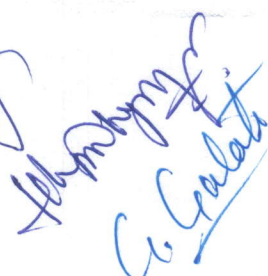











A. Galati

- UNESCO, Bangkok. (2003). Final Report, The Workshop on the Development of Guideline on Teachers Training on ICT Integration and Standards for Competencies, Beijing, China, September 27-29.
- UNESCO, (2005). UNESCO Report: How ICT Can Create New, Open Learning Environments Information And Communication Technologies In Schools A Handbook For Teachers, Division of Higher Education, UNESCO.
- Viva Luchs (2000). Making Multimedia in the Classroom: A Teacher's Guide. RoutledgeFalmer : London.
- W.J. Pelgrum and N. Law (2003). ICT In Education around the world-Trends, Problems and Prospects UNESCO: Paris.

Foundation Course: Language – Hindi

आधार पाठ्यक्रम : हिन्दी भाषा

प्रश्नपत्र – 4

Contact Periods/week: 03

कुल अंक – 60

आन्तरिक मूल्यांकन – 10

प्राप्त एवं अंक निर्धारण

4 सप्ताहात्मक / दोपहस्तसीय प्रश्न – 20 अंक (7 x 4 = 28)

लघुपत्रात्मक प्रश्न – 07 अंक (35 x 2 = 70)

परामुखिक प्रश्न – 03 अंक (1 x 3 = 3)

आन्तरिक एवं सप्ताहात्मक प्रश्नों में आन्तरिक दिकान्त होंगे।

इकाई 1.

1. आरम्भ निर्भरता (विचारिक निबंध) –

पंडित वासुदेव भारद्वाज

2. गुलाम का पालन (एक अर्थपूर्ण कथा) –

मुहम्मद रसूल

3. मध्यप्रदेश की लोक कलाएं –

(संक्षेपित)

4. मध्यप्रदेश की लोक साहित्य –

(संक्षेपित)

इकाई 2.

1. यूरोप में प्राचीन की बात आज (चिंतनपरक) –

सुभाषचंद्र बोस

2. गेहूँ और गुलाब (सामाजिक निबंध) –

सुभाषचंद्र बोस

3. राज्य शासिका (भक्ति, समाज, धर्म) –

(संक्षेपित)

4. मध्यप्रदेश की भिन्नता, गुणवत्ता एवं स्थानीय कला –

(संक्षेपित)

इकाई 3.

1. जनसंचार के माध्यम (चित्र, प्रलेखन, एवं सांख्यिकी) –

(संक्षेपित)

2. पञ्चांग के विभिन्न आचार्य –

(संक्षेपित)

3. राजनीति हिन्दी –

(संक्षेपित)

Foundation Course: Language English

Paper IV

Contact Periods/week: 03

Maximum Marks - 40

Min. Pass Marks - 13

Internal - 10

Distribution of Marks

1. Four critical questions are to be from unit I. Two questions are to be attempted. Each question will carry 5 marks. $5 \times 2 = 10$ Marks
2. Students are required to write a précis of an unseen passage. $5 \times 1 = 5$ Marks
3. Students are required to translate a passage from English to Hindi and a passage from Hindi to English. Each passage which is to be translated will carry 5 marks. $5 \times 2 = 10$ Marks
4. Students are required to attempt 7 questions on Unit IV. Each question will carry one mark. $1 \times 7 = 7$.
5. Students are required to attempt 2 questions from Unit V. Each question will carry 4 marks. $4 \times 2 = 8$.

UNIT I: C. Rajagopalachari - Three questions; C.P. Saron - Rammujan; Roger Rosenblatt - The power of W.E.; Desmond Morris - A short extract from the Naked Ape; O Henry - The Gift of Magic Ruskia Bond - The Cherry Tree

UNIT II: Précis Writing

UNIT III: Translation - English to Hindi, Hindi to English

UNIT IV: Proverbs in English, Punctuation

UNIT V: Communication - Communication through Media

Conversations :-

- I. Introducing yourself & others
- II. Expressing opinions, likes & dislikes
- III. Making requests & offers
- IV. Beginning a conversation
- V. Asking the way
- VI. Expressing doubts & uncertainties
- VII. Talking about future events.

Foundation Course: Environmental Education

Paper I

Contact Periods/week: 03

Maximum Marks - 40

Min. Pass Marks - 10

Internal - 10

Distribution of Marks

All five units are compulsory. Two questions to be set from each unit, one to be attempted.

Objectives:

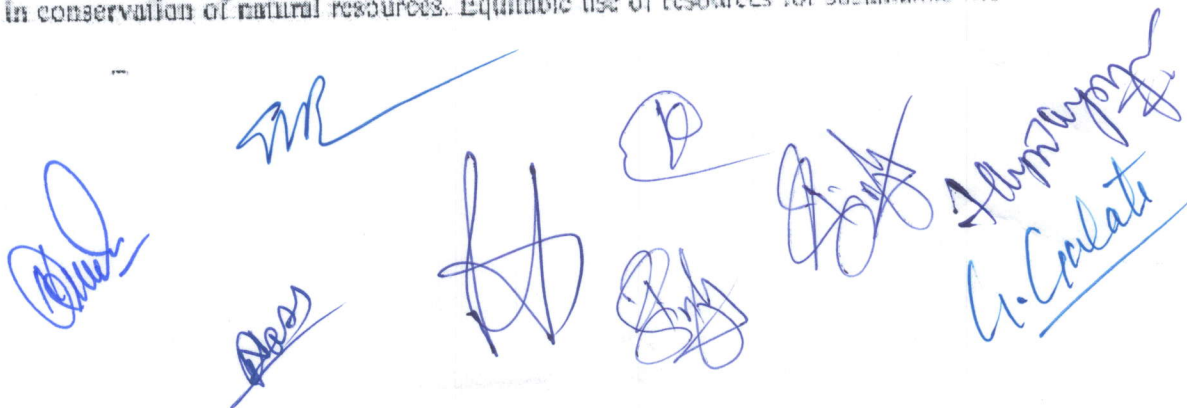
- (i) To provide an understanding to the students about basic aspects of the environment and its concerns.
- (ii) To generate awareness about the social issues of the environment.
- (iii) To enable the students to analyse, evaluate and draw inferences about problems and concerns related to environment.
- (iv) To create awareness about the legal framework for protection of environment and wild life.

Unit I: The multidisciplinary nature of Environmental Studies: Definition, Scope and importance; Need for Public awareness. Natural resources: Renewable and Non-renewable resources and associated problems. Forest resources: Use and over exploitation, deforestation case studies, Timber extraction, mining, dams and their effects on forests and tribal people.

Unit II: Water resources: Use and over utilization of surface and ground water, floods, Drought, conflicts over water resources; dams - benefits and problems. Minerals resources: Use and over exploitation, Environmental effects of extracting and using mineral resources case studies.

Unit III: Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agricultural techniques fertilizer and pesticide problems, water logging and salinity;

case studies. Energy resources: growing energy needs renewable and non-renewable energy resources and use of alternative energy sources - case studies. Land resources: Land as resource, land degradation, man induced landslides, Soil erosion and desertification Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles



Unit IV: Social issues and environment: From unsustainable to sustainable development, Rural, industrial, agricultural fields; Urban problems related to energy, water conservation, rain water harvesting, Watershed management, Resettlement and Rehabilitation of people; its problems and concerns, case studies. Environmental ethics: issues and possible solutions, case studies. Wasteland reclamation, consumerism and waste products

Unit V: Environmental Acts: Environmental Protection Act; Air (prevention and control of Pollution Act)

Water (prevention and control of pollution Act.); Wild life protection Act; Forest conservation Act; Issues involved in enforcement of environmental legislation; Public awareness; Human rights. Value education, HIV/AIDS. Women and Child welfare; Role of Information Technology in environment and human health – case studies.

Elective I – Physics

Paper IV: Oscillations, Waves and Optics

Contact Periods/weeks: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note- At least one question will be set from each unit. 20% of the maximum marks will form simple numerical problems and another 20% would be for objective questions with a provision to provide reasoning. All Questions will have 100% internal Choice

Objectives: After completion of this course, the students will be able to

1. Explain the phenomena pertaining to the concept of waves, their relationship with various forms and wave propagation.
2. Explain formation of images and various defects of images.
3. Discuss the phenomena of interference, diffraction and polarization.
4. Design experiments to observe different optical phenomena and relate them with daily life.

Unit-1: Oscillations

Free Oscillations of simple system; small oscillation approximation solutions; damped oscillation, forced oscillation and resonance; linear and transverse oscillations of a mass between two springs; Diatomic molecule; reduced mass concept.

A. Gulati

Free oscillations of system with two degree of freedom; normal modes, longitudinal and transverse oscillation of coupled masses and energy transfer between modes;

Waves in media: propagation of longitudinal waves in an elastic solid and in a fluid

Unit-2: Geometrical Optics

Fermat's Principle; principle of extremum path, general theory of image formation; cardinal points of an optical system, general relationships, thick lens and lens combinations; Lagrange equation of magnification, telephoto lenses, matrix method in paraxial optic-thin lens formula comparison between Huygens and Ramsden eyepiece.

Aberration in Images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses, Monochromatic aberrations and their reductions, the aplanatic points of a sphere and other applications, aspherical mirrors, oil immersion objectives, meniscus lens.

Unit-3: Wave Optics & Interference

Interference of Light: the principle of superposition, n slit interference, spatial and temporal coherence, optical path retardations, lateral shift of fringes, localized fringes; thin films, Newton's rings and its application. Michelson Interferometer, its application for precision determination of wavelength, wavelength difference and width of spectral lines

Unit-4: Fresnel Diffraction and Fraunhofer diffraction

Fresnel diffraction: Fresnel half-period zones, plates, straight edge and rectilinear propagation. Fraunhofer Diffraction: Diffraction at single slit, double slit and N slit (diffraction grating), blazed grating, diffraction at a circular aperture and a circular disc.

Unit 5: Resolving Power and Polarization

Resolution of images, Rayleigh criterion, resolving power of telescope, grating and prism.

Double refraction and optical rotation: Refraction in uni-axial crystals, its theory, Phase retardation plates; Nicol Prism; rotation of plane of polarization, origin of optical rotation in liquid and in crystals; optical activity; production and detection of linearly and circularly polarised light; Fresnel theory; Faraday rotation; Lorentz half shade polarimeter.

Physics Practical List

1. To determine the wavelength of laser light by grating.
2. To determine radius of curvature of given plano convex lens by Newton's ring apparatus.
3. To determine wavelength of different colours by using transmission grating.
4. To verify Newton's law of combination of lenses by Nodal light assembly.

5. To study the optical rotation by cello tape.
6. To determine the specific rotation of sugar using Laurent's half shade polarimeter.
7. To determine Brewster's angle for a glass surface.
8. To determine resolving power of a telescope.
9. To determine the refractive index of water by Doy's method.
10. Find the frequency of ac mains by maldes apparatus.
11. To determine the wavelength of sodium light by Michelson Interferometer.
12. To detect linearly, circularly and elliptically polarizes light using Babinet compensator.
13. To find the Cauchy's constant for the material of given prism.

Suggested Reading:

1. Ghatak, Physical Optics
2. Sears and Zemanski, Optics and Atomic Physics
3. Goyal, R.P., Unified Physics, Shival Agrawal and Co.,
4. Waves and Vibration, J. Pain

Elective I – Botany

Paper IV: Genetics and Biotechnology & Economic Botany

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note: Two questions will be set from each unit and students are required to attempt one question from each unit.

Objectives : To enable the students to analyse patterns of inheritance, structural and functional aspects of genes and their application in the study of biotechnology to enable student to know use of plant for human welfare

Unit I

Mendelian genetics; Mendel's law of inheritance, linkage and crossing over, allelic and non allelic interactions

Gene expression: Structure of gene, transfer of genetic information, genetic code, ribosomes transcription, translation, protein synthesis, regulation of gene expression in prokaryotes and eukaryotes, proteins, 1D, 2D and 3D structure.

Unit II

Genetic variation: Mutations – spontaneous and induced, transposable genetic elements, DNA damage and repair Extracellular genome : Presence and function of mitochondrial and plastid DNA; plasmids.

Unit III

Genetic engineering :

Tools and techniques of DNA recombinant technology, cloning vectors, genomic and c-DNA library, techniques of gene mapping and chromosome walking.

Unit IV

Biotechnology: Functional definition, cellular totipotency, basic aspect of plant tissue culture, differentiation and morphogenesis. Biology of Agro bacterium. Vectors for gene delivery and marker genes. Salient Achievements in crop biotechnology.

Unit V

Food Plants	:	Rice, Wheat, Maize, Potato, Sugarcane
Fibers	:	Cotton and Jute
Vegetable Oils	:	Groundnut, Mustard and Coconut
General account of sources of firewood, timber and bamboos		
Spices	:	General account
Beverages	:	Tea and Coffee
Medicinal Plants	:	General account

Practical

Objectives:

- To develop the skills for the preparation of inheritance pattern.
- To impart the skills of isolation of DNA
- To familiarize the students with the technique of micro propagation and isolation of protoplast.
- To study identify plant for human welfare

Genetics

1. Working out the laws of inheritance using seed mixtures/flowers.

G. Gopalakrishnan

2. Working out the mode of inheritance of linked genes from test cross and/or F₂ data.
3. Isolation of DNA from plant material.
4. Isolation of protoplasts from different plant tissues.
5. Demonstration of the technique of micro propagation.
6. Identification of plant and their used in human welfare

Scheme of Practical Examination

Max. Marks : 25+5=30

Time : 3 hrs.

1. Demonstration of techniques of micro propagation.
2. Isolation of protoplast from different tissues.
3. Demonstration of Mendel's laws of inheritance.
4. Comment upon the spots. (1-5)
3. Practical Record/Sessional
6. Internal evaluation
4. Viva-voce
5. Sessional and practical record.

5

5

5

5

5

5

Suggested Readings

1. Gardner, E.J. Principles of Genetics, John Wiley and Sons Inc. New York
2. Snustad, D.P. and Simmons, M.J., 2000, Principles of Genetics. John Wiley & Sons Inc. USA
3. Atherly, A.G. Gorton J.R., and Mc Donald, J.F. 1999, The Science of Genetics, Saunders College Publishing, Fort Worth USA
4. Sient, G.S., 1986, Molecular genetics, CBS Publications
5. Wolfe S.L., 1993, Molecular and Cell Biology, Wadsworth Publishing Co., California, USA
6. Russel P.J., 1998, Genetics, The Benjamin/Cummings Publishing Co. Inc., USA
7. Ableris, B. Bray, D., Lewis, J. Raff M., Roberts, K and Watson L.D., 1999, Molecular Biology of Cell, Garland Publishing Co. Inc. New York. USA
8. Dixon, R.A., 1987, Plant Cell Culture, A Practical approach IRL, Press Oxford
9. Smith, R.H., 2000, Plant Tissue Culture, Techniques and Experiments, Academic Press New York
10. Kumar, U. 2003, Methods in Plant Tissue Culture. 2nd edition, Agrobios, India

11. Dwivedi, Padmanabha. 2004. Plant Tissue Culture, Scientific Publishers (India)
12. Watson, James D., T.A. Baker, S.P. Bell, A.Gann, M.Levine, R.Lasick 2004. Molecular Biology of the Gene. 5th edition, Pearson Education
13. Gupta, P.K. 2006-07. Cell and Molecular Biology. 3rd edition. Rastogi Publication.
16. Pandey B.P 2000 Economic Botany S.Chand & Co. New Delhi.
17. Bhatnagar S.K. 2001 Hand Book Of Medicinal Plants.

Elective II – Chemistry

Paper IV

Contact Periods/week: 05 + 4 Practical

Maximum Marks – 60

Min. Pass Marks – 20

Internal – 15 (Theory 10 & Practical 5)

Practical – 25 (External)

Note: Two questions will be set from each Unit and the candidates will be required to attempt one:

Objectives:

After completing this semester the students should be able to:

- (i) acquire the knowledge of basic terms involved in thermo-dynamics and assess their significance in study of the thermodynamics.
- (ii) develop the mathematical form of first law of thermodynamics from law of conservation of energy and appreciate the application of this law in Joule-Thompson effect and various thermo chemical laws.
- (iii) develop the concept of entropy by Carnot cycle and examine it as a criteria of spontaneity and equilibrium.
- (iv) Comprehend the concept of free energy change and chemical potential and correlate the free energy change with feasibility of any physical and chemical process.
- (v) Judge the importance of ClausiusClapeyron equation in the study of various processes.
- (vi) Understand Gibb's phase rule equation and apply this equation to one component and two component systems.

- (vii) Get acquaintance with the importance of critical solution temperature for some partially miscible liquids.
- (viii) Correlate electrical conductance with various parameters that affect this and learn the application of conductivity measurement in determining certain important physical parameters.
- (ix) Visualize the difference between reaction velocity and mechanical velocity and appreciate to learn the techniques to determine the reaction velocity.
- (xi) Correlate reaction rate and temperature and carefully examine the development of some theories based on this correlation.

Instructional Strategy:

In teaching thermodynamics the teacher should make a conscious effort to convey the importance of mathematical modelling of concepts in physical sciences. Intentional cognitive conflict at times may also be used as a teaching strategy particularly in the transaction of Joule-Thomson effect. The use of concept attainment model may be practiced while discussing various enthalpies. The use of Inductive and deductive approach may be practiced in dealing with the Le-Chatelier Principle. Use of ICT may be made in the transaction of phase equilibrium. The practice of experimental approach may be highlighted while discussing: Distribution Law, conductance and its applications and ascertaining the kinetic parameters of some reactions cooperative learning may be practiced in dealing with chemical equilibrium.

Unit I Thermodynamics – I

Definition of thermodynamic terms: system, surroundings etc. Types of systems: intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law- Joule-Thomson coefficient and inversion temperature. Calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: standard state, standard enthalpy of formation-Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit II Thermodynamics - II

- (A) Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy: entropy as a state function, entropy as a function of V & T , entropy as a function of P & T , entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P , V and T .

(B) Chemical Equilibrium

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction isotherm and reaction isochore-Clausius equation and Clausius - Clayron equation, applications.

UNIT III: Phase Equilibrium

Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system - water, CO_2 and S systems. Phase equilibria of two component system - solid-liquid equilibria, simple eutectic - $Bi-Cd$ $Pb-Ag$ systems, desilverisation of lead.

Solid solutions - compound formation with congruent melting point ($Mg-Zn$) and incongruent melting point, ($NaCl-H_2O$), ($FeCl_3-H_2O$) and $CuSO_4-H_2O$ system. Freezing mixtures, acetone-dry ice.

Liquid - liquid mixtures - Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes- $HCl-H_2O$ and ethanol - water systems.

Partially miscible liquids - Phenol-water, trimethylamine-water, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation. Nernst distribution law - thermodynamic derivation, applications.

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UNIT IV: Electrochemistry

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-insoluble salt-anion and redox electrodes, Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes-standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K), polarization, over potential and hydrogen overvoltage.

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and PK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Buffers – mechanism of buffer action, Henderson-Hasselbalch equation. Hydrolysis of salts. Corrosion – types, theories and methods of combating it

UNIT V: Chemical Kinetics

Definition of rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light and catalyst. Reaction order, mathematical expression for zero order, first and second orders. Determination of order of reactions-half-life, differential, integration and isolation methods. Radioactive decay as an example of first order reaction. Experimental methods of kinetics; conductometric, potentiometric and spectrophotometric

(elementary ideas). Simple collision theory, expression for the rate constant (without derivation). Transition state theory based on thermodynamic equilibrium. Expression for rate constant involving equilibrium

Suggested Readings for Semester IV

1. Glasstone, S., Chemical Thermodynamics East - West Publication
2. Glasstone, S., Physical Chemistry - East - West Publication
3. Atkins, P.W., & Paula, J.D., Physical Chemistry, Oxford Press
4. Silby, R.J., and Alberty, R.A., Physical Chemistry John Wiley & Sons, Inc.
5. Gurudeep Raj, Advanced Physical Chemistry Goel Publication
6. Puri, Sharma & Pathania, Physical Chemistry Sohan Lal Nagin Chand & Company
7. Rakshit, P.C., Physical Chemistry New Age International
8. Laidler, K.J., Chemical Kinetics T.M.H Publication

CHEMISTRY PRACTICALS

1. Determination of transition temperature of given solid by thermometric method.
2. To determine the solubility of benzoic acid in water at different temperatures and to determine H of dissolution process.
3. To determine the strength of given acid conductometrically using given standard alkali solution.
4. To determine ionization constant of weak acid conductometrically.
5. To determine solubility and solubility product of sparingly soluble salt conductometrically.
6. To study the rate constant of hydrolysis of ethyl acetate catalysed by H^+ ion at room temperature.
7. To compare the strength of HCl and H_2SO_4 by studying kinetics of hydrolysis of ethylacetate.
8. Determination of rate constant of inversion of cane sugar in presence of an acid using polarimeter.
9. Determination of order of saponification of ester with $NaOH$.
10. Determination of strength of acid by potentiometric titration.
11. Determination of partition coefficient of I_2 in water and chloroform.
12. Determination of enthalpy of neutralization of weak acid/weak base vs. strong acid/strong base to determine the enthalpy of ionization of weak acid/weak base.

Semester IV

Two experiments are to be done by the examinees each containing 7^{1/2} marks.

Experiments

15

Internal assessment

5

Viva

5

Elective III - Zoology

Paper IV : LABORATORY TECHNIQUES AND MOLECULAR BIOLOGY

Maximum Marks - 60

Min. Pass Marks - 20

Internal - 15 (Theory 10 & Practical 5)

Practical - 25 (External)

Objective - To understand the molecular basis of inheritance & development of phenotype to utilize it as bacteriological tool and study the usage & application of lab techniques.

Unit-1.

1. Cell fractionation, different types of centrifuges.
2. Microscopy (light, TEM, SEM).
3. Principles and types of Chromatography & Electrophoresis.
4. Microtomy (Concepts, principles, types of microtome & their uses).
5. General idea of some common fixatives, stains and reagents.
6. pH - Definition, study of pH-meter, determination of pH.

Unit-2.

1. Structure and types of Nucleic acid (DNA & RNA).
2. Concept of genes, genome & proteome.
3. Nucleosome concept (solenoid model), split genes overlapping genes, pseudo genes.
4. Concept of DNA replication and repair (Eukaryotic & Prokaryotic)
5. Types, causes & effects of Mutation.

Unit-3.

1. Transcription (in Prokaryotes & Eukaryotes).
2. Translation in Prokaryotes & Eukaryotes.
3. Genetic Code.

4. Gene regulation in Prokaryotes (lac operon & trp operon).

Unit-4

1. Techniques used in recombinant DNA technology
2. Uses of vectors, linkers, adaptors, & genetic library
3. Gene cloning & its significance.
4. Application of genetic engineering.

Unit-5.

1. Polymerase chain reaction.
2. Gene therapy.
3. DNA fingerprinting.
4. Animal cell and tissue culture and their applications.

PRACTICAL

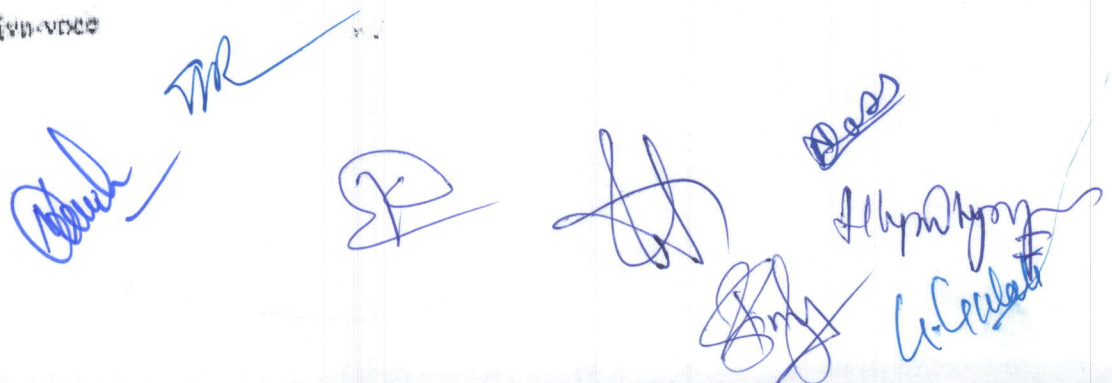
Objective - To develop skills to use common laboratory instruments to analyse cellular & biochemical processes & products and identification of molecular events of inheritance along with vehicles of heredity.

Identification of spots related to theory.

1. Study of DNA and RNA through charts and models.
2. DNA isolation.
3. DNA staining.
4. Quantification of DNA by DPA.
5. Quantification of RNA by Orcinol.
6. Culture of bacteria.
7. Restricting growth of bacteria in culture.
8. Paper chromatography.
9. Histological slide preparation.
10. Visit to nearest pathology/LTD for exposure to instruments like RT-PCR, ELISA

SCHEME OF PRACTICAL EXAMINATION

1. Spotting	-	08
2. Molecular Biology/Bacteriology Experiments	-	05
3. Chromatography/Histological Staining	-	04
4. Practical Records and Tour report	-	04
5. Viva-voce	-	04



Referred books -:

1. Experimental Biochemistry- Wilson & Walker
2. Bioinstrumentation-Boyer
3. Molecular Biology -David Fritfelder
4. Genes - Benjamin Lewin.
5. Biotechnology -V. Satyanarayan.
6. Biotechnology - B.D.Singh
7. Biotechnology - R.C.Dubey

Elective III - Mathematics

Contact Periods/week: 05 + 4 Practicum

Maximum Marks - 30+30=60

Min. Pass Marks - 20

Internal - 15 (Theory 10 & Practicum 5)

Practicum - 25 (Internal)

M - 4.1 ELEMENTS OF GROUPS AND RINGS

Time : 3 Hrs. Max. Marks : 30

Pass Marks : 12

NOTE : Two questions will be set from each unit with Internal choice

Objectives : To develop understanding of Groups, Sub-Groups and Rings

- Unit - I Definition of a group with examples and simple properties, subgroups, Generator of groups, cyclic groups
- Unit - II Coset decomposition, Lagrange's theorem and its consequences, Fermat's and Euler's theorems.
- Unit - III Homomorphism and Isomorphism, Normal-subgroups, Quotient groups, fundamental theorem of Homomorphism.
- Unit - IV Permutation groups, Even and Odd permutations, the alternating group, Cayley's theorem.
- Unit - V Introduction to rings, subrings, Integral Domains and Fields, characteristic of a ring.

Content as in

1. I.N. Heirstein - Topics in Algebra wiley Eastern limited
2. John B Fraleigh, A First Course in Abstract Algebra, Pearson
3. Joseph A Gallian, Contemporary Algebra, Narosa Publication

M – 4.2 MECHANICS

Time : 3 Hrs. Max. Marks : 40

Pass Marks : 12

NOTE : Two questions will be set from each unit with Internal choice

Objectives :

- To develop understanding of dynamics of a particle
- To develop the skill of solving two problems dealing with forces in space.
- To develop understanding of motion in resisting medium
- To develop the understanding of the dynamics of rigid bodies.
- To develop the understanding of the dynamics of a particle involving varying mass.

- Unit – I Analytical conditions of equilibrium of coplanar forces. Virtual work.,
- Unit – II Velocities and accelerations along radial and transverse directions, and along tangential and normal directions,
- Unit – III Catenary, Simple harmonic motion, Elastic strings.
- Unit – IV Stable and unstable equilibrium, Poinsot's central axis.
- Unit – V Forces in three dimensions, Motion in a resisting medium. Motion of particles of varying mass.

Content as in :

- | | | |
|---------------|----------|----------------|
| 1. S.L. Loney | Statics | Mc Millan & Co |
| 2. S.L. Loney | Dynamics | " |

M – 4.3 Mathematics Practicum

Max.Marks : 25

Pass Marks : 10

List of Activities:

- Activity oriented problem solving / Experiments using Mathematical software or computer programming language based on the content studied in semester IV Mathematics papers M-4.1 and M-4.2.
- Mathematics seminar.



Education Component:

Inclusive Education

Contact Periods/week: 01

Maximum Marks – 40

Min. Pass Marks – 13

Internal – 10

Objectives

On completion of this course the students will be able to:

- Develop sensitivity towards Inclusive Education,
- Understand the concept, need and scope of Inclusive Education.
- Understand the philosophical and historical perspectives of Inclusive Education.
- Understand the implication of inclusive education on Education for All movement.
- Understand the global and national commitments towards Inclusive Education.
- Develop a critical understanding of the recommendations of various committees/commissions/policies/schemes towards teacher preparation for inclusive school.
- Identify, analyze and utilize various instructional strategies for Inclusive Schools.
- Identify and utilize existing resources for promoting inclusive practices.
- To develop positive attitude and sense of commitment towards actualizing the Right to Education of all learners.
- Examine the issues of identity and diversity in society in general and education in particular.
- Understand as how to seek parental commitment and NGOs support for utilizing available resources for education in Inclusive Schools, and
- understand the nature, needs and functional assessment of learners with reference to diverse needs and how to create conducive teaching-learning environment in Inclusive Schools.

UNIT I: Introduction and Initiatives Taken for Inclusive Education

- Concept, need and scope of Inclusive Education.
- Philosophy of Inclusive Education.
- Education of All Movement and Inclusive Education (A journey from segregation to inclusion)

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- The Universal Declaration of Human Rights (1948) and the UN Convention on the Rights of the Child (CRC),
- Salamanca Statement and Framework for action on Special Needs Education (UNESCO, 1994)
- The National Policy of Education (1986),
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, and RCI Act,
- Sarva Shiksha Abhiyan, RMSA and Inclusive Education.
- Scheme of IEDSS 2009, Right to Education Act 2009, and Right to Persons with Disability Bill, 2014.

UNIT II: Creating an Inclusive School

- Index of Inclusion- culture, policy and practice
- Removal of Barriers for effective learning in inclusive school
- Factors for successful inclusion, features of an inclusive school, role and functions of regular classroom teachers and resource teachers in an inclusive school.
- How an inclusive environment is created by the teachers in school? Support services required in an inclusive school.
- Role of parents, community, school functionaries and NGOs in Inclusive Education.

UNIT III: Diversity in the Classroom

- Diversity and inclusion, whole school scenario with reference to diversity, diversity in the classroom.
- Nature and needs of learners with diverse needs in inclusive setting with reference to learners with
- Visual, hearing, locomotor and neuromuscular impairments,
- Cerebral palsy, intellectual impairment and learning disabilities.
- Multiple and other disabilities (Autism spectrum disorder, behavioral, emotional and speech disorder, ADD and ADHD, Learners with special health problems.
- Environmental/ ecological difficulties and learners belonging to other marginalized groups.

UNIT IV: Teaching in Inclusive School

- Adaptation in instructional objectives and curricular activities for meeting diverse needs of learners in inclusive school

- Need for flexible evaluation system and alternate assessment. Instructional strategies (challenges in teaching all children, assessing instructional needs)
- Multi- methodology, multicultural approaches, differential instruction, collaborative learning and system approach, competencies required for the teachers in inclusive schools.
- Assistive Devices and Strategies for meeting learning needs of diverse learners

Modes of Transaction:

Lecture-cum-discussion, group work, field visits of schools/NGOs and the institutions working in the education of learners with diverse needs to get first hand exercise on inclusive practices, library studies and project works.

Sessional Work

The students may take any two of the following activities

- Field visits to schools/ Institutions/ NGO promoting education of learners with diverse needs in inclusive settings and have discussions with the teachers/ functionaries and make observation and analysis of teaching learning practices there.
- Analysis of policy documents related to inclusive education
- Make a list of existing resources in the local area and discuss the use and limitations based on survey of schools with reference to Inclusive practices.
- Study of TLM and equipments used in the education of learners with diverse needs
- Conduct suitable action research in an inclusive setting
- Conduct a survey on the type of supportive services needed for inclusion of learners with special needs
- Preparation and implementation of IEP or case studies.

Suggested Books:

- Ainscow, M. and Booth, T. (2002) Index for Inclusion: Developing Learning and Participation in Schools. Bristol: CSIE.
- Ainscow, M., Dyson, A. and Booth, T. (2006) Improving Schools, Developing Inclusion. London: Routledge.
- Ainscow, M. (1999) Understanding the Development of Inclusive Schools. London: Falmer Press.
- Booth, T., Nes, K., Stromstad, M. (2003) Developing Inclusive Teacher Education. London: Routledge Falmer.

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- Clough, P. and Corbet, J. (2002) Theories of Inclusive Education - A Students' Guide, Paul Chapman Publishing Ltd.
- Deiner, L. Penny, (2010), Inclusive Early Childhood Education 5th Ed. Wadsworth Cengage Learning Belmont, CA USA
- Hegarty, S. and Mithu Alur (2002) Education and Children with Special Educational Needs- Segregation to Inclusion, New Delhi: Sage Publication India Pvt. Ltd. LALIEDSS 2002 MHRD, New Delhi
- Index of Inclusion (2014) NCERT, New Delhi.
- Jangra, N.K. and Ahuja, A. (2002): Effective Teacher Training: Cooperative Learning Based Approach: National Publishing house 23 Daryaganj, New Delhi
- Jangra N.K. and Mani, M.N.G. (1990): Integrated Education for Visually Handicapped Gurgaon, Old Subjmandi, Academic Press.
- Jha, M. (2002) Inclusive Education for All: Schools Without Walls. Heinemann Educational Publishers, Multivista Global Ltd, Chennai
- Julka, A (2006) Inclusive children and youth with disabilities in Education- a guide for practitioners NCERT, New Delhi
- Kurutha, P. and Rozario, J. (2003) Learning Disabilities in India, New Delhi: Sage Publication India Pvt. Ltd.
- Loveman, Tim, Deppeler, J. and Harvey, D. (2005) Inclusive Education- a Practical Guide to Supporting Diversity in the Class, London: Routledge Falmer.
- Lowenfeld, B (1973) (Ed) The Visually Handicapped Child in School New York: John Day
- National Policy of Education 1986 (revised 1992)
- Nind, M., Rix, J., Sheehy, K. & Simmons, K. (2005) Curriculum and Pedagogy in Inclusive Education. Values into Practice, London: Routledge Falmer
- Nielsen, L.B. (1998) The Exceptional Child in a regular Classroom- an Educator's Guide., Corwin Press Inc. A Sage Publication Company, California.
- Nind, M., Rix, J., Sheehy, K., and Simmons, K. (2005) Curriculum and Pedagogy in Inclusive Education Values and Practice, London: Routledge Falmer.
- O'Hanlon, C. (2003) Educational Inclusion as Action Research. Glasgow: Open University Press
- Persons with Disabilities Act, 1995

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- Understand the policy perspectives on examinations and evaluation and their implementation practices
- Trace the technology based assessment practices and other trends at the international level

UNIT-I: Perspectives on Assessment and Evaluation

- Meaning of Assessment, Measurement, Tests, Examination, and Evaluation and their interrelationships
- Concept of different types of Assessment: Assessment - of Learning; for learning, as Learning and in Learning
- Principles of Assessment and Evaluation
 - Behaviourist, Cognitivist and Constructivist
- Purposes of Assessment: Monitoring of Learning, Providing Feedback, Promotion, Placement, Certification, Grading and Diagnostic.

UNIT-II: Assessment in school

- Need for continuous, formative and diagnostic assessment Classification of assessment based on
 - Purpose: prognostic, formative, diagnostic and summative
 - Scope: teacher made, standardized
 - Attribute measured: achievement, aptitude, attitude, etc.
 - Nature of interpretation: norm referenced, criterion referenced
 - Context: internal, external
- Need for Continuous and Comprehensive Assessment
- Grading: Concept, Types and Application

UNIT-III: New Trends in Evaluation (Need and Use)

- Question bank, Grading system, Online Examination, Open Book Examination, Credit System, Exam on Demand (meaning & uses only)
- Performance based assessment
- Assessment through Rubrics
- Portfolio Assessment

UNIT-IV: Elementary Statistics

- Nature of Data: grouped and Ungrouped

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- Organization and presentation of Data: Bar diagram, histogram, polygon, ogive, and Pie Chart
- Measure of central tendency: Mean, Median and Mode
- Measure of dispersion: Range, Quartile Deviation, Mean Deviation, and standard deviation
- Concept of Correlation: Rank order correlation

Sessional Work

- Develop a Power Point Presentation on the current practices of Assessment and
- Evaluation at the Upper Primary Stage
- Analyse the question papers of the subject of your choice (Previous-3 Years)
- Classes X and XII (any board) in the light of new approach of assessment
- Develop a question paper for upper primary and secondary stage to assess all the aspects of language learning using ICT as a tool.
- 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

Suggested readings

- Bransford, J., Brown, A.L., & Cocking, R.R. (Eds.) (2000). how people learn: Brain, mind, experience, and school. Washington, DC: National Academy Press.
- Burke, K. (2005). How to assess authentic learning (4th ed.). Thousand Oaks, CA: Corwin.
- Burke, K., Fogarty, R., & Belgrad, S (2002). The portfolio connection: Student work linked To standards (2nd Ed.) Thousand Oaks, CA: Corwin.
- Carr, J.F., & Harris, D.E (2001). Succeeding with standards: Linking curriculum, assessment, and action planning. Alexandria, VA: Association for Supervision and Curriculum Development.
- Danielson, C. (2002). Enhancing student achievement: A framework for school improvement. Alexandria, VA: Association for Supervision and Curriculum Development.
- Gentile, J.R. & Lulley, J.P. (2003). Standards and mastery learning: Aligning teaching and

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- Guskey, T.R., & Hailey, J.M. (2001). Developing grading and reporting systems for student learning. Thousand Oaks, CA: Corwin.
- Natrajan V. and Kulshreshtha SP (1983). Assessing non-Scholastic Aspects-Learners Behaviour. New Delhi: Association of Indian Universities.
- NCERT (1985). Curriculum and Evaluation. New Delhi: NCERT
- Newman, F.M. (1996). Authentic achievement: Restructuring schools for intellectual quality. San Francisco, CA: Jossey-Bass.
- Nitko, A.J. (2001). Educational assessment of students (3rd ed.). Upper Saddle River, NJ: Prentice Hall.
- Norris N. (1990) Understanding Educational Evaluation, Kogan Page Ltd.
- Singh H.S. (1974) Modern Educational Testing. New Delhi: Sterling Publication
- Ward & Ward (2007) Assessment in classrooms.

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G. Guleria