A) Open Elective Courses

Students of all PG programmes under CBCS (w.e.f. 2016-17) are required to study one open elective course in each of the 2nd and 3rd Semesters for 2-Years Programmes and in each of the 4th and 5th semesters for 3-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

Sr. No.	Nomenclature of the course	Course Code	Offered by the Department	Offered for Semester
1	Principles and Applications of Agriculture Biotechnology-I	16CBTO1	Biotechnology	2nd Sem
2	Principles and Applications of Agriculture Biotechnology-II	16CBTO2	Biotechnology	3rd Sem
3	Principles and Applications of Biotechnology-I	16CBTO3	Biotechnology	2nd Sem
4	Principles and Applications of Biotechnology-II	16CBTO4	Biotechnology	3rd Sem
5	Basic Biochemistry	16BCHO1	Bio-Chemistry	2nd Sem
6	Human Health & Nutritional Disorders	16BCHO2	Bio-Chemistry	3rd Sem
7	Plant Resource Utilization	16BOTO1	Botany	2nd / 3rd Sem
8	Fundamental of Income Tax	16COMO1	Commerce	2nd / 3rd Sem
9	Cyber Forensic & Security	16CSAO1	Computer Science	2nd / 3rd Sem
10	National Security of India	16DSSO1	Defence & Strategic Studies	2nd / 3rd Sem
11	Fundamental Aspects of Education	16EDUO1	Education	2nd Sem
12	Trends and Concerns of Teacher Education	16EDUO2	Education	3rd Sem
13	Environmental Issues	16ENVO1	Environmental Science	2nd Sem
14	Disaster Management	16ENVO2	Environmental Science	3rd Sem
15	Food Adulteration	16FTEO1	Food Technology	2nd / 3rd Sem
16	Genetics & Society	16GENO1	Genetics	2nd
17	Forensic Science	16GENO2	Genetics	3rd Sem
18	Basics of Geoinformatics	16GEOO1	Geography	2nd / 3rd Sem
19	Bhartiya Sahitya	16HNDO1	Hindi	2nd / 3rd Sem
20	Fundamentals of Management	16IMSO1	IMSAR	2nd Sem
21	Fundamentals of Marketing	16IMSO2	IMSAR	3rd Sem
22	Family Law	16LAWO1	Law	2nd Sem
23	Constitutional Law	16LAWO2	Law	3rd Sem
24	Academic Integrity & Plagiarism	16LISO1	Library & Information Science	2nd Sem

25	Information Sources and Literacy	16LISO2	Library & Information Science	3rd Sem
26	Mathematical Techniques and Applications	16MATO1	Mathematics	2nd Sem
27	Parametric & Non-Parametric Tests	16MATO2	Mathematics	2nd Sem
28	Statistical Tools using SPSS	16MATO3	Mathematics	3rd Sem
29	MATLAB	16MATO4	Mathematics	3rd Sem
30	Microbial World-Diversity and Applications	16MCBO1	Microbiology	2nd Sem
31	Microbial Technology for Entrepreneurship	16MCBO2	Microbiology	3rd Sem
32	Sources of Energy-I	16PHYO1	Physics	2nd Sem
33	Sources of Energy-II	16PHYO2	Physics	3rd Sem
34	Media & Society	16JRMO1	Journalism	2nd / 3rd Sem
35	Ancient Indian Culture & Philosophy	16SKTO1	Sanskrit	2nd / 3rd Sem
36	Quantitative Techniques	16STAO1	Statistics	2nd Sem
37	Sampling & Estimation Techniques	16STAO2	Statistics	3rd Sem
38	Optimization Techniques	16STAO3	Statistics	2nd / 3rd Sem
39	Applied Zoology	16ZOOO1	Zoology	2nd Sem
40	Wild Life and Conservation	16ZOOO2	Zoology	3rd Sem

M.Sc Agriculture Biotechnology   **Semester-II**
Course Title: Principles and Applications of Agriculture Biotechnology-I
                                                                    MM. Th 80+IA 20
                                                                    Time: 2 h
Course Code No. 16CBTO1
NOTE: In all four questions will be set, two from each unit and one compulsory question of short answer type covering all the two units. Students are required to attempt one compulsory question and two other questions selecting at least one from each unit.
Theory

UNIT I

Tools and techniques used in agriculture biotechnology, restriction digestion (restriction endonucleases, types and mechanism), ligases, alkaline phosphatases, polynucleotide kinase, SI nuclease, DNAse, RNAse, scoreable and selectable markers. PCR, C-DNA and genomic libraries.

UNIT II

Plant tissue culture and its application in crop improvement. Recombinant DNA technology and cloning vectors, Different methods of gene transfer in plants (*Agrobacterium* mediated transfers, microinjection, eletroporation, somatic cell hybridization).

UNIT III

Genetic and Molecular basis of Heterosis and Apomixis and their significance, Mutations and polyploidy in crop improvement, Molecular markers, Marker assisted breeding, QTL mapping, Origin, evolution and cultivation practices of the major crop plants. Improvement of crop plants: increase in iron, protein and amino acids, golden rice colours – anthocyanins, betalaines, crocin and crocetins. Flavours–capsaicin, vanillin, stevioside thaumatin. Developing vaccine and plantibodies, terminator technology and male sterility

Suggested readings:
1. Hou CT, Shaw JF (2009) – Biocatalysis and agricultural biotechnology, CRC Press, USA
2. Agricultural biotechnology, 1st edition, (2008) Rawat H, Oxford Book Co, India.
3. Agrobiotechnology and plant tissue culture, Bhojwani SS, Soh WY, Oxford & IBH Publ, India
4. Agricultural biotechnology, (2005), Kumar HD, Daya Publ House, India
5. Plant molecular breeding, (2009), Newbury HJ, John Wiley and Sons., USA.
6. Embryology of Angiosperms, (2009), S.S. Bhojwani and S.P. Bhatnagar, Vikas Publ House, India.
7. Ashwani Kumar, Shekhawat NS (2009) – Plant tissue culture and molecular markers: theor role in improving crop productivity (IK International) 8. Biotechnology, 4th edition, (2010), H K Das, Wiley India Pvt. Limited, India
8. Biotechnology, 4th edition, (2010), H K Das, Wiley India Pvt. Limited, India

M.Sc Agriculture Biotechnology   **Semester-III**
Course Title: Principles and Applications of Agriculture Biotechnology-II

MM. Th 80+IA 20
Time: 2 h

Course Code No. 16CBTO2
NOTE: In all four questions will be set, two from each unit and one compulsory question of short answer type covering all the two units. Students are required to attempt one compulsory question and two other questions selecting at least one from each unit.
Theory

UNIT I
Gene Cloning and DNA Analysis in Agriculture: Methods in Molecular Cloning, Transformation of DNA: Chemical method and Electroporation; Gene delivery: Microinjection, eletroporation, biolistic method (gene gun), liposome and virus mediated gene delivery, *Agrobacterium* mediated gene delivery.

UNIT II
Development of transgenics for abiotic & biotic stress tolerance, Plants that make their own insecticides - The δ-endotoxins of *Bacillus thuringiensis,* Herbicide resistant crops (roundup ready crops), Gene subtraction: RNA silencing, CRISPER technology.

UNIT III
Genetically modified Crops: safety, risks and public concerns: GM foods-merits and demerits, Safety tests on commercial GM crops (GM maize, GM potatoes, GM rice, GM cotton, peas), Allergenicity studies, Public concerns-global scenario, Consumer's attitude towards GM foods, GM foods: issues with respect to India. Traceability of GMOs in the food production chain, Environmental and Safety concerns with selectable markers, The terminator technology, The possibility of harmful effects on the environment and humans.

Suggested readings:
1. Hou CT, Shaw JF (2009) Biocatalysis and agricultural biotechnology, CRC Press, USA
2. Brown, TA (2010) Gene Cloning and DNA Analysis: An Introduction, Sixth Edition. A John Wiley & Sons, Ltd., Publication, Germany.
3. Bhojwani SS, Soh WY (2005) Agro biotechnology and plant tissue culture, Oxford Press.
4. Clark DP, Pazdernik NJ (2009) Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA.
5. Primrose SB, Twyman RM (2006) Principles of Gene Manipulation and Genomics, 7th Edition. Blackwell Publishing, Oxford, U.K.
6. Kumar HD (2005) Agricultural biotechnology, Daya Publ House, India
7. Newbury HJ (2009) Plant molecular breeding, John Wiley and Sons., USA.
8. Kumar A, Shekhawat NS (2009) Plant tissue culture and molecular markers: their role in improving crop productivity (IK International)
9. Das HK (2010) Biotechnology, 4th Edition, Wiley India Pvt. Limited, India
10. Bawa AS and Kumar A (2013) Genetically modified foods: safety, risks and public concerns. J Food Sci Technol. 50(6): 1035–1046.

M.Sc Biotechnology   **Semester-II**
Course Title: Principles and Applications of Biotechnology-I

MM. Th 80+IA20
Time: 2 h

Course Code No. 16CBTO3
NOTE: In all four questions will be set, two from each unit and one compulsory question of short answer type covering all the two units. Students are required to attempt one compulsory question and two other questions selecting at least one from each unit.

UNIT I

Molecular cloning tools; Restriction modification systems: Types I, II and III. Mode of action and nomenclature, DNA modifying enzymes and their applications: DNA polymerases, DNA phosphatases, and DNA ligases; Cloning Vectors: Definition and Properties, Plasmid vectors: pBR and pUC series; Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, linkers and adaptors.

UNIT II

Protein expression vectors: *E. coli* lac and T7 promoter based vectors, yeast YIp, YEp and YCp vectors, Baculovirus based vectors, mammalian SV40 based expression vectors, Methods in Molecular Cloning, Transformation of DNA: Chemical method & Electroporation; Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery, Agrobacterium mediated delivery, in vitro culture of plant and animal cells

UNIT III

DNA Amplification and DNA sequencing; PCR, RT-PCR, Sanger's method of DNA Sequencing: traditional and automated sequencing, Introduction to next generation sequencing, Chromosome walking & jumping, shotgun sequencing. Preparation, uses and screening of Genomic and cDNA libraries; Colony hybridization and colony PCR applications of Recombinant DNA Technology; Products of recombinant DNA technology: Products of human therapeutic interest-insulin, antisense molecules, Applications of recombinant DNA in crop improvement, Gene therapy, Recombinant vaccines, Protein engineering, Site directed mutagenesis and Biosensor technology

Suggested readings:
1.   Brown, TA (2010) Gene Cloning and DNA Analysis: An Introduction, Sixth Edition. A John Wiley & Sons, Ltd., Publication, Germany.
2.   Clark DP, Pazdernik NJ (2009) Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA.
3.   Primrose SB, Twyman RM (2006) Principles of Gene Manipulation and Genomics, 7th Edition. Blackwell Publishing, Oxford, U.K.
4.   Wiley JM, Sherwood LM, Woolveron CJ (2008) Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education.
5.   Primrose SB and Twyman RM (2008) Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

M.Sc Biotechnology   **Semester-III**
Course Title: Principles and Applications of Biotechnology-II
                                                                                             MM. Th 80+IA 20
                                                                                                   Time: 2 h
CourseCode No. 16CBTO4
NOTE: In all four questions will be set, two from each unit and one compulsory question of short answer type covering all the two units. Students are required to attempt one compulsory question and two other questions selecting at least one from each unit.

UNIT I

Production of proteins from cloned genes: Cloning vectors and expression vectors, primer designing, open reading frame (ORF) and DNA Restriction pattern analysis, *E. coli* expression vectors, criteria for choosing different vectors, importance of different *E. coli* strains for expression, optimization of expression of recombinant proteins in *E. coli*, Codon optimization.

UNIT II

General problems with the production of recombinant proteins in *E. coli*, Dealing with insoluble proteins, Recombinant protein production in Eukaryotic cells. Processing, purification and characterization of recombinant proteins. Applications of recombinant protein production.

UNIT III

Study of Genomes: Genome annotation, identifying the genes in a genome sequence, determining the function of an unknown gene. Study of gene expression and regulation: identification of gene transcript, identifying protein binding sites on a DNA molecule: methods to study DNA protein interactions. Identification of promotor and control sequences, Analysing and comparing transcriptome, *in vitro* transcription, studying and comparing proteome: 2DE, MudPIT, LC-MS. Protein-Protein interactions (PPIs).

Suggested readings:
6.   Brown, TA (2010) Gene Cloning and DNA Analysis: An Introduction, Sixth Edition. A John Wiley & Sons, Ltd., Publication, Germany.
7.   Clark DP, Pazdernik NJ (2009) Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA.
8.   Primrose SB, Twyman RM (2006) Principles of Gene Manipulation and Genomics, 7th Edition. Blackwell Publishing, Oxford, U.K.
9.   Wiley JM, Sherwood LM, Woolveron CJ (2008) Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education.
10.   Primrose SB and Twyman RM (2008) Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

Open Elective papers offered by Department of Biochemistry

16BCHO1: Basic Biochemistry

Note: Question 1 will be compulsory and will cover the entire syllabus in the form of short questions. Question 2 to 5 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, three questions to be attempted. All questions to carry equal marks.

MM. Th 80+IA 20

UNIT I:

*Cell***:** definition, general structure and size of some important cells, general functions of cell organelles, basic difference in prokaryotic and eukaryotic cells

Carbohydrates: Definition, classifications and sources of carbohydrates, occurrence and biological functions of monosaccharides, disaccharides, and polysaccharides

*Lipids***:** Introduction, classification and functions of lipids. Saturated and unsaturated fatty acids.Essential fatty acids.Triacylglycerides and their properties,

*Amino acids***:** Nutritionalclassification of amino acids and physical properties of amino acids. *Proteins***:** Definition, types, sources, properties and biological significance of proteins,Primary, secondary, tertiary and quaternary structure of proteins.

UNIT 2:

Nucleic acids: Nucleotides & nucleosides, types of DNA and RNA, evidence that DNA is the genetic material, feature of DNA double helix, Size of DNA in prokaryotic and eukaryotic cells. *Vitamins***:** Sources, examples and classification, important functions of fat soluble and water soluble vitamins

Enzymes: History, general characteristics, nomenclature and IUB classification of enzymes, holoenzyme, apoenzyme, coenzymes, prosthetic groups, cofactors, activators, inhibitors, active site, metalloenzymes and isozymes, Units of enzyme activity, examples of some clinically important enzymes

Factors affecting enzyme activity: pH, temperature, time of incubation, enzyme concentration and substrate concentration. Properties of allosteric enzymes and their significance.

<u>Suggested Readings for 16BCHO1: Basic Biochemistry</u>:

1. Lehninger Principles of Biochemistry 4th Ed **By** David L. Nelson and Michael M. Cox, WH Freeman and Company.

2. Principles of Biochemistry **By** Geoffrey Zubay. Publisher: McGraw Hill College.

3. Biochemistry: The Molecular Basis of Life **By** Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.

4. Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 **By** D Voet. John Wiley and Sons.

5. Biochemistry **By** U. S. Satyanarayana

6. Outlines of Biochemistry **By** Eric C Conn, PK Stumpf, G Bruening and Ray H. Doi. John Wiley & Sons.

16BCHO2 :Human Health and Nutritional Disorders

Note: Question 1 will be compulsory and will cover the entire syllabus in the form of short questions. Question 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

MM. Th 80+IA 20

Unit I

*Food Physiology***:** Concept of balanced diet and energy content of foods; Basal and resting metabolism- influencing factors, Absorption of carbohydrates, lipids, proteins, nucleic acids, minerals and vitamins.

Common metabolic disorders: Diabetes mellitus, disorders of HDL-cholesterol, LDL-cholesterol, triglycerides, phenylketonuria, albinism.

Antioxidants: Free radicals: definition, formation in biological Systems. Natural anti-oxidants, defense against free radicals. Role of free radicals and antioxidants in health and disease.

Unit II

Vitamins: Dietary sources, biochemical functions and specific deficiency diseases associated with fat and water soluble vitamins; Hypervitaminosis symptoms of fat-soluble vitamins.

Minerals: Dietary sources and deficiency disorders of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper.

Malnutrition and blood disorders: Etiology, clinical features, metabolic disorders and management of Marasmus and Kwashiorkor, Nutritional anemia - vitamin B_{12}, folate and iron deficiency anemia; hemoglobinopathies and thalassemias.

Unit III

Obesity: Definition, classification and biochemical basis; Genetic and environmental factors leading to obesity; Obesity related diseases and management of obesity.

Cardiovascular disease: Diseases of Liver, Gall bladder & Pancreas-Hepatitis, (A, B, and C), alcoholic liver disease, Gall stones, pancreatitis, Prevention and dietary management.

Clinical significance of aspartate aminotransferase, alanine aminotransferase, lactate dehydro-genase, amylase, lipase and trypsin.Diagnosis of jaundice and clinical importance of bilirubin.

Suggested Readings for 16BCHO2: Human Health and Nutritional Disorders:

1. Textbook of Medical Biochemistry *By* MN Chatterjea and Rana Shinde, Jaypee Brothers.

2. Review of Medical Physiology (Lange Basic Science) (Paperback) *By* William F. Ganong. Publisher: McGraw-Hilll Medical

3. Clinical Biochemistry *By* Richard Luxton. Scion Publishing Ltd.

4. Principles of Medical Biochemistry: With STUDENT CONSULT Online Access (Paperback) *By* Gerhard Meisenberg and William H. Simmons. Publisher: Mosby.

5. Essentials of Food and Nutrition Vol I & II, *By* M. Swaminathan. Bangalore Printing and Publishing Co. Ltd.

6. Modern Nutrition in Health and Diseases, *By* Maurice E Shils and Vernon Robert Young, 7th Ed., Pub: Lea &Febiger.

7. Handbook of Nutrition and Food 2nd Ed., *By* Carolyn Berdanier, Johanna Dwyer and Elaine Feldman, CRC Press

8. Nutritional Biochemistry (Hardcover) *By* Tom Brody. Academic Press.

9. Nutritional Biochemistry (Paperback) *By* S Ramakrishnan and S. Venkat Rao. TR Publications

10. Nutritional Biochemistry and Metabolism: With Clinical Applications (Hardcover) *By* Maria C. Linder. Publisher: Appelton and Lange

DEPARTMENT OF BOTANY

Open Elective Paper: Plant Resource Utilization
Semester-II, III: Paper Code: 16BOTO1

MM. Th 80+IA 20
Time: 3 hrs.

Note: The examiner is required to set even questions in all. Question No. 1 will be compulsory and short answer type covering the entire syllabus. The remaining six questions will be set with two questions from each unit. The candidate will be required to attempt Question 1 and four more selecting at-least one from each unit.

UNIT-I

Origin of Agriculture, World Centres of Primary diversity of domesticated plants: Plant Introductions and Secondary Centres.
Botany, Cultivation, Harvesting and uses of Wheat and Rice.
Botany, Cultivation and uses of following fruits and vegetables: Mango, Apple, Banana, Potato, Alliums, Cabbage, Spinach and Tomato

UNIT-II

General Account of the Spices: Ginger, Turmeric, Cinnamon, Clove,
Beverage Plants: Source and general account of Tea and Coffee.
Legumes: Origin, Botany, Cultivation and uses of Pigeon pea, Chick pea, Cluster bean
Medicinal Plants: Plants as sources of drugs, parts used and uses.
Fibres: Types of fibres - Soft fibres, Hard fibres, Surface fibres, Brush fibres and Braiding fibres.

UNIT-III

Gums: Important commercial gums and their uses.
Tannins and Dyes: Sources and their uses.
Vegetable Oils and Fats: Distinction between fatty and essential oils. Drying (Soyabean and linseed), nondrying (Groundnut and Mustard oil) and Semi drying (cottonseed and Sunflower oil) oils and their uses.
Wood and its Uses: Soft woods and hard woods, wood as fuel, construction material Genetic Resources and their conservation.

SUGGESTED READINGS
1. Anonymous. *National Gene Bank*: Indian Heritage on Plant Genetic resources (Booklet). National Bureau of Plant Genetic Resource, New Delhi. 1997.
2. Cobley, L.S. and W.M. Steels. *An Introduction to the Botany of Tropical Crop*

Plants.3rd Ed. The English Language Book Society and Longman, London. 1979.

3. Bole, P.V. and Y. Vaghani. *Filed Guide to Common Indian Trees.* Oxford University Press, Mumbai. 1991.

4. Chandel, K.P.S., G. Shukla and N. Sharma. *Biodiversity in Medicinal and Aromatic Plants in India: Conservation and Utilization.* National Bureau of Plant Genetic Resources, New Delhi. 1996.

5. Conway, G. and V.W.Rattan. *The Doubly Green Revolution. Food for all in the 21st Century*. Cornell Univ. Press. 1999.

6. Dastur, J.F. *Medicinal Plants of India and Pakistan.*3rd Ed. Meyerbooks. 1985.

7. Hill, A.F. *Economic Botany.* McGraw Hill Book Co. Inc., New York. 1986.

8. Kirtikar, K.R. & D.D. Basu. *Indian Medicinal Plants.* Vols. I & II. 2nd Ed. Lalit Mohan Basu, Allahabad. 1953.

9. Kochhar, S.L. *Economic Botany of the Tropics*.2nd Ed. MacMillan India Ltd., Delhi.

10. Leonard, W.H. & J.H. Martin. *Cereal Crops.* MacMillan Co., New York, USA. 824 pp. 1963.

Maximum Marks: 100
Credits: 3:0:0   **Theory Marks: 80**
Time Allowed: 3 Hours   **Internal Assessment Marks: 20**

Note: The examiner shall set nine questions in all covering the whole syllabus. Question No.1 will be compulsory covering all the units and shall carry 8 small questions of equal marks. The rest of the eight questions will be set from all the four units. The examiner will set two questions from each unit out of which the candidate shall attempt four questions selecting one question from each unit. All questions shall carry equal marks.

Unit-I
Introduction: Meaning of tax, scope, objectives, importance, Important terms-assessee, person, previous year, assessment year, income, gross total income, total/taxable income, casual income, agriculture income, company , tax evasion, tax avoidance, tax planning, tax management.

Unit-II
Determination of residential status and incidence of tax with reference to residential status of an individual; exempted incomes of an individual

Unit-III
Income from various heads (basic introduction only), clubbing of incomes, set of and carry forward of losses, Computation of gross total income and taxable income.

Unit-IV
Computation of tax liability of an individual; filling and filing of Income Tax Returns (ITR-I & II only).

Note:
1. The objective of this paper is to make the students familiar with the mechanism of Income Tax Law
2. The examiner is not required to ask the students to calculate income from various heads of an individual. The examiner is also required to give computed incomes from different heads in the question paper.

3. The actual amount of allowed deductions with section must be given clearly in the question.

Suggested Readings:

1. *Direct Taxes law & Practice – Dr. H.C.Mehrotra & Dr. S.P. Goyal, Sahitya Bhawan Publications, Agra.*
2. *Direct Taxes & Practice – Dr. V.K. Singhania Taxmann Publication.*
3. *Direct Taxes law & Practice – Dr. Bhagwati Prasad – Wishwa Prakashan, N.Delhi.*
4. *Simplified Approach to income Tax: Dr. Girish ahuja & Dr. Ravi Gupta – Sahitya Bhawan Publishes & Distributors, Agra.*

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
OPEN ELECTIVE COURSE

CYBER FORENSIC AND SECURITY
Paper Code: 16CSAO1

MM. Th 80+IA 20
Time: 3Hrs.
Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-1
Introduction to Information Systems: Types of information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Security Investigations.
Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Security Threats to E-Commerce, Cyber-crimes.

UNIT-2
Cyber Forensics: Cyber Security, Cyber Security roles, Cyber Security Principles, Difference between information Security and Cyber Security, Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems

UNIT-3
Ethical Hacking: Essential Terminology, Hacking windows – Network hacking – Web hacking – Password hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.

UNIT-4
Cyber Crimes and Cyber Security Standards: Crime incident Handling Basics: Cyber activism, Tracking hackers, clues to cyber-crime, privacy act, search warrants, common terms, organizational roles, procedure for responding to incidents, reporting procedures, legal considerations, Information Technology Act 2000: Scope, jurisdiction, offense and

contraventions, powers of police, adjudication, Intellectual property issues in cyberspace, ISO, Copyright Act, Patent Law, Cyber Laws in India.

Reference Books:
1. V.K. Pachghare, "Cryptography and Information Security", PHI Learning Private Limited, India.
2. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall.
3. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press.
4. John W. Rittinghouse, William M. Hancock, "Cyber Security Operations Handbook", ElsevierPub.
5. Deborah G Johnson, "Computer Ethics", 4ᵗʰ Edition, Pearson Education Publication.
6. Earnest A. Kallman, J.P Grillo, "Ethical Decision making and IT: An Introduction with Cases", McGraw Hill Publication.
7. Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen Kumar Shukla, "Introduction to Information Security and Cyber Law", WilleyDreamtech Press.
8. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global.
9. Cahnder, Harish, "Cyber Laws and Its Protection", PHI Learning Private Limited,Delhi,India
10. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", Cengage Learning Pub.
11. Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security", Pearson Education India.
12. Joseph M Kizza, "Computer Network Security", Springer Verlag.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
DEPT. OF DEFENCE AND STRATEGIC STUDIES
Scheme of Examination
(As per Choice Based Credit System w.e.f. the academic year 2016-17)

Open Elective Offered by the Department

Paper Code	Sem.	Title of the Paper	Course Type	Theory marks	Internal Assessment Marks	Practical marks	Total Marks	Credits (L:T:P)
16DSSO1	2nd /3rd Sem.	National Security of India	OE	80	20	N.A.	100	3:0:0

OPEN ELECTIVE OFFERED BY THE DEPARTMENT
Of
Defence and Strategic Studies

SEMESTER-II/III
PAPER -01
PAPER CODE-16DSSO1
NATIONAL SECURITY OF INDIA

Maximum Marks: 100

Credits: 3:0:0   **Theory Marks: 80**

Time Allowed: 3 Hours   **Internal Assessment Marks: 20**

INSTRUCTION FOR THE PAPER SETTERS

The Paper-Setters/Examiners will have to set Eight Question, selecting two from each out of Unit-I,II, III and IV. And one question consisting of Ten short answer type questions, without it any internal choice covering the entire syllabus be set in Unit V of the question Paper.

The Question Paper will consist of five units: I, II, III, IV and V. Unit-V will be compulsory. The first Four Units will contain two questions each from the respective syllabus and each question will carry 15 marks. Unit V of the question and will contain Ten short answer type question, with any internal choice and will cover the entire syllabus uniformly. Each short answer type question will carry Two marks. The Question Paper should be set strictly according to the syllabus. Separate marks for each question. Should be indicated in the question papers.

UNIT-I

1.   **National Security Concepts:-**

   a)   **Definition of National Security, National Defence and National Interest.**

   b)   **Elements of National Security.**

UNIT-II

2.   **National Security Structure:-**

   a)   **National Security Council and Cabinet Committee on Security affairs.**

   b)   **Armed Forces, Para-Military Forces.**

UNIT-III

3.	**Threats to Indian Security:-**

a)	**Internal – Threats**

b)	**External – Threats**

UNIT-IV

4.	**India and Its Neighbours:-**

a)	**India's Geo-Strategic Location**

b)	**India's Relations with its neighbours**

Books Recommended

1. Howard, Michael, "Theory and Practice of War"

2. Howard, Michael, "The Causes of War"

3. Bernard Black, L, "War and Its Causes"

4. Wright, Quincy, "A Study of War"

5. Mao-Tse-Tung, "Guerilla Warfare"

6.	Legueur Walter, "Guerilla Warfare"

7.	Robert E. Osgood, "Limited War – The Challenges to American Strategy".

8.	Rees David, "Korea, the limited War"

9.	Kitson Frank, "Low Intensity Operations, Subversion Insurgency, Peace keeping"

10.	Osanka F.M., "Modern Guerilla Warfare"

11.	Nasution, Abdul H., "Fundamentls of Guerilla Warfare"

12.	Brodie, Bernard, "Strategy in the Missile Age"

13.	Sampooraan Singh, "India and the Nuclear Bomb"

14.	Tirpathi, K.S., "Evolution of Nuclear Strategy"

15.   Gupta, Rakesh, "Militarisation of outer-space"

16.   Encyclopedia Britannica

17.   Halperin Morton H., "Defence Strategies for the seventies"

18.   Mir Publications, "Weaponary in Space, The Dilemma of Society"

OPEN ELECTIVE - I (FUNDAMENTAL ASPCETS OF EDUCATION)
16EDUO1

Time: 3 Hours   **Max. Marks: 100**
Credits: 03   **(Theory: 80, Internal: 20)**

NOTE FOR PAPER SETTER

I   Paper setter will set 9 questions in all, out of which student will be required to attempt 5 questions

II Q. No. 1 will be compulsory and will carry 16 marks. It will comprise of 4 short answer type questions of 4 marks each to be selected from the entire syllabus.

III Two long answer type questions will be set from each of four units, out of which the students will be required to attempt one question from each unit. Long answer questions will carry 16 marks each.

IV All questions carry equal marks

COURSE OBJECTIVES:

After completing the course, the students will be able to:

understand nature and functions of education and philosophy and their relationship

explain the meaning, types and scope of educational technology

acquaint the learner with the process of development and assessment and its implication in teaching learning process

develop an understanding of different stages of growth and development.

understand the concept of educational sociology and sociology of education.

acquaint students with the basics of social organization and its concept.

develop an understanding of different factors influencing social organization-folkways, mores, institutions; values.

> **COURSECONTENTS**

UNIT – I

Education and Philosophy

Concept of Education and Philosophy.

Nature of Education and Philosophy.

Relationship of Education and Philosophy.

Need of Philosophical Foundations of Education.

Branches of Philosophy; Metaphysics, Epistemology and Axiology, their implications for Education; Philosophical redirection of educational research in recent times.

UNIT–II

Educational Technology. Meaning, Nature, Approaches, Types, Scope And Significance Of Educational Technology

Programmed Instruction: Concept, Principles and Styles of Programmed Instruction Development of Programmed Instructional Material.

ICT In Education; Computer Assisted Instruction, Computer Managed Learning And
 Process of development of Computer based instructional material, Web Integrated Learning.

E-Learning and Virtual classrooms.

UNIT-III

Developmental Aspects of the Learner

Educational Psychology: Concept and scope

Concept of Teaching and learning

Role of Educational Psychology in the Teaching –learning process

Concept of Growth and development and principles' of development and its implications to teaching and learning process.

Genetic epistemology of Jean Piaget.

Motivation: Need, types and how can a teacher motivate students for learning.

Factors affecting Learning.

UNIT – IV

Concept of Educational Sociology and Sociology of Education

Social organization and its concepts.

Factor influencing social organization-folkways, mores, institutions; values.

Dynamic characteristics of social organization and its educational implications.

Education as an investment.

Brain drain: Concept, factors responsible for Brain drain, how to check brain drain from our country.

Suggested Readings:

Andrews, T.W. (1961).Methods in Psychology, New York: John Wiley and Sons, Inc.

Baller, Warren R., Don, C.(1962). The Psychology of Human Growth and Development, New York: Holt, Rinehart and Winston.

Banerjee A.C. & Sharma S.R. (1999) : Sociological and Philosophical issues in Education, Jaipur : Book Enclave.

Bhushan, A & Ahuja, M. (1992), Educational Technology, Meerut : Vikas Publication.

Bloom, B.S. (1972), Taxonomy of Educational Objectives. A Hand Book- I (Cognitive Domain), New York: Devid Mokeay Campo.

Chauhan S.S.(1978), A Textbook of Programmed Instruction, New Delhi : Sterling Publishers.

Das, R.C.(1993), Educational Technology: A Basic Text, New Delhi: Sterling Publishers.

Dave, R.H (1969). Taxonomy of educational objectives and achievement testing; development of educational testing vol. 1. London: University of London Press.

Mangal. S.K. (2009). Essentials of Educational Technology. New Delhi: Prentice Hall of India pvt. Ltd.

Sharma, Hemant Lata (2014). Innovative inputs in ICT. Jalandhar: Amit Prakashan.

Sharma, Hemant Lata & Sharma, Savita (2010). Learning to Learn With Love : Theory and Practices of Co-operative Learning, New Delhi : Gagandeep Publication.

Pnadey, K.P.(1983). Perspective in Social Foundation of Education, Amitash Prakashan, Ghaziabad.

Kamat, A.R.,(1985).Education and Social Change in India, Samaiya Publishing Co., Bombay.

Maunheim, K.et al.,(1962). An Introduction to Sociology of Education. Routledge and Kegam Paul,London.

Mossish , Loor., (1972). Sociology of Education: An introduction, George Allen and Unwin, Londo

Walia J.A., (2011): Philosophical, Sociological and Economic Bases of Education, Jalandhar: Ahim Paul Publishers

16 EDU02
OPEN ELECTIVE - II (TRENDS AND CONCERNS OF TEACHER EDUCATION)

Time: 3 Hours **Max. Marks: 100**
Credits: 3 **(Theory: 80, Internal: 20)**

NOTE FOR PAPER SETTER

Paper setter will set 9 questions in all, out of which student will be required to attempt 5 questions

Q. No. 1 will be compulsory and will carry 16 marks. It will comprise of 4 short answer type questions of 4 marks each to be selected from the entire syllabus.

Two long answer type questions will be set from each of four units, out of which the students will be required to attempt one question from each unit. Long answer questions will carry 16 marks each.

All questions carry equal marks

COURSE OBJECTIVES:

After completing the course, the students will be able to:

Develop an idea about the structure of secondary education in India.

Understand the recommendations of different education commissions regarding secondary & Senior Secondary education commissions.

Acquaint the students with the need, scope and purpose of educational management in terms of national needs.

make aware of the importance of making right choices in life, education, vocation etc.

develop and promote understanding of basic principles, areas, importance of guidance and counseling.

make students conversant with the practices of guidance and vocational choices.

understand the concept of teacher education along with its need and scope

understand the objectives of teacher education at elementary, secondary and higher education

develop understanding about the structure, curriculum and modes of pre- service teacher education and needs of innovation in pre-service teacher education programmes describe the need, concept and scope of teacher education and historical development with special emphasis on different documents.

develop in students an understanding of the concept and philosophy of inclusive education in different contexts

develop in students an understanding of the nature and types of diverse learners

enable students to analyze the trends and issues in inclusive education

UNIT- I

Introduction to Secondary & Senior Secondary Education

Meaning, Aims & Objectives of Secondary & Senior Secondary Education

Secondary Education in India- Historical perspectives, pre & post Independence

Recommendations of various committees and commissions: Secondary Education Commission, Kothari Commission, Programme of Action 1992, NPE 1986, Ramamurti Review Committee, Janardhan Reddy Committee, Yashpal Committee, RMSA & NCF-2005

Educational Management

Meaning, Concept & need for Educational Management at Secondary to Senior Secondary School Level

Management at Nation: MHRD,CABE, NCERT

UNIT – II

Introduction to Guidance

Guidance Movement in India: Pre & Post Independence.

Concept, Principles & Functions of Guidance.

Types of Guidance: Educational, Vocational, Social& Personal Guidance.

Group Guidance: Meaning, Objectives, Characteristics, Advantages, Problems, Principles & Techniques.

Contemporary Models of Guidance; Mathewson Model, Sholen's Model, Chapman Model & Hoyt's Model.

Introduction to Counseling

Concept, Principles, Techniques & Procedure of Counselling.

Approaches of Counseling: Directive, Non-Directive, Eclectic Counselling.

Theories of Counseling: Freud's Psychoanalytic, Behaviouristic, Gestalt

Skills of Counseling: Building Trust, Listening, Observation & Empathy

Counselor: Characteristics, Functions &Ethics

UNIT-III

Teacher Education Introduction to Teacher Education

Concept, Need and Scope of Teacher Education.

Historical Development of Teacher Education

Aims and Objectives of Teacher Education at:

i) Elementary Level.
ii) Secondary Level.
iii) Higher Level.

Pre- Service Teacher Education: Concept, Nature, Objectives and Scope.

In-service Teacher Education; concept, Need, Objectives and areas of Professional development.

Quality Assurance in Teacher Education

UNIT – IV

Inclusive Education for Children with Diverse needs

a) **Introduction to Inclusive Education**: Definition, concept and importance of Inclusive Education.
   Concept of Access, Equity, Diversity, Human Rights & Social Justice.
   Readiness of School, Principles and Models of Inclusion

b) **Children with Diverse Needs**

Definition and characteristics of children with sensory (hearing, visual and physically challenged) intellectual (gifted, talented and children mentally challenged children), developmental disabilities (autism, cerebral palsy, learning disabilities), social and emotional problems, scholastic backwardness, under-achievers, slow learners and other marginal groups.

Suggested Readings:

Aggarwal, J.C. (2008). Education in the Emerging Indian Society. Delhi: Shipra Publication.

Chauhan, S. (2012). Educational Management. New Delhi: Pearson Publication.

Sharma, R.A.(2009). Educational Administration & Management. Meerut:R Lal Book Depot.

Vashist, S.R. (2008). Educational Administration in India. New Delhi:Anmol Publication Pvt. Ltd.

Aggarwal, R. (2010). Elementary Guidance and Counselling , New Delhi: Shipra Publication.

Bala, Rajni.(2007). Guidance and Counselling: Modern Review, New Delhi: Afa Publication.

Chandra, R.(2009). Career information and Guidance and Counselling, Delhi:Isha Books.

Gibson, R. L. &Mitchell, M. (2008). Introduction Counselling and Guidance, New Delhi: PHI Learning Pvt. Ltd.

Kottler, J. A. & Shepard, D. S.(2008). Counselling Theories & Practices, Cenage Learning:1st Edition.

Rao, S N.(2006). Counselling and Guidance ,Delhi :McGraw hill Publication.

Rao, S. N.& Hari, H. S.(2004). Guidance and Counselling,New Delhi:Discovery Pub. House.

Saxena, A. (2006). Organization of Guidance Service ,Delhi: Rajat Publications.

Shrivastava, K.K. (2003). Principles of Guidance &Counselling , New Delhi : Kanishka Publishers. Singh, R. (2002). Educational & Vocational Guidance , New Delhi : Commonwealth Publishers

Yadav, R.H. (2012). Guidance & Counselling , New Delhi: APH Publishing Corporation

National Curriculum Framework for Teacher Education; Towards Preparing Professional and Humane Teachers, (2009) NCTE. New Delhi.

Mangla, S. (2000). Teacher Education: Trends and Strategies. New Delhi : Radha Publishing.

MHRD (1986). National Policy of Education and Program of Action. New Delhi, Govt. of India.

MHRD (1992). Program of Action. New Delhi, Department of Education, Govt. of India.

Govt. of India (1992). Report of C.A.B.E... New Delhi: Committee Department of Education.

Kohli, V.K. (1992). Teacher Education in India, Ambala: Vivek Publishers.

N.I.E.P.A. (1984). Report on Status of Teachers, New Delhi.

Sharma, R.A. (2005). Teacher Education, Meerut: Loyal Book Depot.

Udyaveer (2006). Modern Teacher Training, New Delhi: Anmol Publications

Ahuja. A; Jangira, N.K. (2002). Effective Teacher Training; Coop erative Learning Based Approach. New Delhi National Publishing house.

Bartlett, L. D. and Weisentein, G. R. (2003). Successful Inclusion on for Educational Leaders . New Jersey: Prentice Hall.

Daniels, H. (1999). Inclusive Education. London: Koegan.

Gore, M. C. (2004). Successful Inclusion Strategies for Secondary and Middle School Teachers, Crowin Press: Sage Publications.

Hegarthy, S. & Alur, M. (2002). Education of Children with Special Needs : from Segregation to Inclusion, Corwin Press: Sage Publishers.

Jha, M. M. (2002). School without Wal ls: Inclusive Education for All. Oxford: Heinemann Education.

Karten, T. J. (2007). More Inclusion Strategies that Wor k . Corwin Press, Sage Publications.

Panda, K. C. (1997). Education of Exceptional Children. New Delhi: Vikas Publications.

Rayner, S. (2007). Managing Special and Inclusive Education , Sage Publications.

Sharma P.L (2003). Planning Inclusive Education in Small Schools, R.I E. Mysore

Open Elective

16ENVO1: Environmental Issues

MM. Th 80+IA 20   Time : 3 Hours.

Note: 1. Seven questions will be set in all.
2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining six questions will be set with two questions from each unit. The candidate will be required to attempt five in total, Question I and four by selecting at least one from each unit.

Unit-1
Global Environmental Issues: Green House effect – causes and associated hazards, Ozone layer depletion – causes and associated hazards, Deforestation, Human Population Growth. Environmental problems associated with urbanization, industrialization, modernization of agriculture

Unit-2
Regional Environmental Issues: Forest and Wildlife management, desertification, reclamation of degraded land; Human intervention on wetlands, siltation and eutrophication, reclamation of wetlands, Mining and Environment, Open cast mining, Oil exploration and transportation, Deforestation and their impact on environment.

Unit-3
Pollution: Air Pollution : Causes of air pollution, Some important pollutants of air (CO, SO_X, NO_X and HC and Particulates) – their sources and effects on living and non-living organisms. Water Pollution: Sources of pollution of surface and ground water, Types of water pollutants. Solid Waste – Sources, characterization, disposal and management. Soil Pollution sources of soil pollution, Pollution and residual toxicity from the application of insecticides, pesticides and fertilizers; Soil erosion.

List of Recommended Books

1. Fundamentals of Environmental Science: G. S. Dhaliwal, G. S. Sangha and P. K. Raina, Kalyani Publication
2. Environmental Chemistry : A. K. De
3. Environmental Chemistry : B.K. Sharma, and H. Kaur
4. Fundamentals of Ecology : E. P. Odum
5. Environmental Science (6th ed) (1997): Jr. G. T. Miller, Wadsworth Pub. Co.

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Semester –III
Open Elective

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16ENVO2: Disaster Management   Time : 3 Hours.
MM. Th 80+IA 20

Note: 1. Seven questions will be set in all.
2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining six questions will be set with two questions from each unit. The candidate will be required to attempt five in total, Question I and four by selecting at least one from each unit.

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UNIT- I

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Disaster- Causes and phases of disaster, Rapid onset and slow onset disasters. Nature and responses to geo-hazards, trends in climatology, meteorology and hydrology. Seismic activities. Changes in Coastal zone, coastal erosion, beach protection. Coastal erosion due to natural and manmade structures.

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UNIT- II

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Floods and Cyclones: causes of flooding, Hazards associated with flooding. Flood forecasting. Flood management, Integrated Flood Management and Information System (IFMIS), Flood control. Water related hazards- Structure and nature of tropical cyclone, Tsunamis – causes and physical characteristics, mitigation of risks.

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UNIT- III

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Earthquakes: Causes and characteristics of ground-motion, earthquake scales, magnitude and intensity, earthquake hazards and risks, Volcanic land forms, eruptions, early warning from satellites, risk mitigation and training, Landslides.
Mitigation efforts: UN draft resolution on Strengthening of Coordination of Humanitarian Emergency Assistance, International Decade for Natural Disaster Reduction (IDNDR), Policy for disaster reduction, problems of financing and insurance.

Reference Books:
1. Bolt, B.A. Earthquakes , W. H. Freeman and Company, New York. 1988
2. Carter, N,W. Disaster Management: A Disaster Manager's Hand Book, Asian Development Bank, Manila. 1992
3. Gautam Ashutosh. Earthquake: A Natural Disaster, Ashok Publishing House, New Delhi. 1994
4. Sahni, P.and Malagola M. (Eds.).Disaster Risk Reduction in South Asia, Prentice-Hall of India, New Delhi. 2003.
5. Sharma, V.K. (Ed.). Disaster Management, IIPA, New Delhi. 1995.
6. Singh T. Disaster management Approaches and Strategies, Akansha Publishing House, New Delhi. 2006
7. Sinha, D. K. Towards Basics of Natural Disaster Reduction, Research Book Centre, New Delhi. 2006
8. Smith, K. Environmental Health, Assessing Risk and Reduction Disaster, 3rd Edition, Routledge, London. 2001 21

Food Adulteration

PAPER CODE: 16FTEO1

There will be seven questions in all. The first question will be compulsory and short answer type covering the entire syllabus. The remaining six questions will be set with two questions from each unit. The candidate will be required to attempt question 1 and four more selecting atleast one from each unit.
 MM. Th 80+IA 20

Time: 3h

Unit I

Basic food groups, Function of foods and its general composition.

Food Quality & Safety, various aspects of food quality & safety, challenges of food safety.

Food adulteration and contamination, common food contaminants & adulterants

Unit II
Food Adulteration: Nature of adulterants, methods of evaluation of food adulterants and toxic constituents in foods, common food adulterants & their detection on various foods like

- a) Milk and Milk products
- b) Oils and fats
- c) Spice and condiments
- d) Wheat and other flours
- e) Sugar and Preserve
- f) Fruit and Vegetable products
- g) Beverages Alcoholic and Non-Alcoholic

Unit III
Food Laws and Regulation: Prevention of Food Adulteration Act 1954, Food Safety and Standards Act (2006), Food Safety and Standards Authority of India (FSSAI), BIS, FPO, APEDA.

Recommended Books:

1. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
2. Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
3. Rekha S. Singhal , Pushpa R. Kulkarni, Dananesh V. Rege, (1997). Hand Book of Indices of food Quality and Authenticity, wood head Publishing Ltd.
4. Siva Kiran, R.R. (2012). Manual for Detection of Common Food Adulterants, First Edition, IAPEN.
5. Battershal, J.P. (2013). Food Adulteration & its detection, General Books LLC.
6. Prevention of Food Adulteration Act, 4th Edition, Ashoka Law House, 2002

Open Elective Paper (offered by Department of Genetics)

Paper Code: 16GENO1   **Genetics &Society**   **Credits: 3**

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Internal Assessment Marks: 20
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Time: 3 Hrs   **Max. Marks: 80**

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Instructions
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There will be a total of seven questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining six questions will include two questions from each unit. The students will be required to attempt one question from each of the four units. The students will attempt four questions in all.

Unit I

Basic principles of inheritance of characters, Chromosomes and genes, pedigree-gathering family history symbols, construction of pedigree ; Consanguinity and its effects; Sex linked anomalies: Haemophilia, Colour blindness; Sex limited and sex influenced traits.Human Health and Disease: Common syndrome according to numerical and structural alteration: Klinefilter, Down's, Turner, Achondroplasia,; Inherited enzyme defects in man: Albinism, Galactosemia; Multifactorial disorders: Diabetes, Schizophrenia, Huntington's disease, Alzheimer's disease; Methods of genetic testing, Prenatal diagnosis, New born screening;DNA fingerprinting:Paternity testing, Individual Identification.

Unit II

GM World: Green revolution, Application r-DNA technology in agriculture: Transgenic crops, Gene gun, GM foods, Ht, Bt and others, Concerns about bio-safety of genetically modified organism (GMO) (Allergen, toxicity, impact on biodiversity etc.); Indian regulatory system for testing of GMOs in laboratory, field trials and commercial release of transgenic ;potential benefits of GMOs.

Unit III

Microbial innovations in pharmaceutical, health, agricultural and industrial sectors; Strategies for selection and improvement of industrial strains of microorganisms;
Stem cell research, Cloning designer babies, Organ banking, Transgenic animals, Creating transgenic animals, In vitro fertilization, Genetic counseling and reproductive decisions, Eugenics;
Role of Genetics for the improvement of Health,Agriculture and environment.

Suggested books:

1   Principles of Genetics by D. Peter Snustad and Michael J Simmons
2   Genes in the Environment- Rosie S. Hails, Wiley-Blackwell Publications
3   The Science of Genetics by Alan G. Atherly, Jack R. Girton, John F. McDonald
4   Principles and branches of Medical Genetics, Emery and Rimoih, Churchill Livingstone, Newyork, Vol-1-3.
5   Industrial Microbiology, G. Reed (editor), CBS Publishers (A VI Publishing Company).
6   Modern Microbial Genetics (2002)-Streips U. N. and Yasbin R.E., Wiley-Liss
7   Plant Biotechnology (2006) - B. D. Singh, Kalyani Publishers
8   Plant Biotechnology-The Genetic Manipulation of Plants (2003) Slater A. Scott N. & Fowler M., Oxford University Press Inc Nigel Jen,
9   Animal Cell Biotechnology:Methods and protocols, Humana Press.
10   Genetics in Medicine 7th Ed (2007) - Thompson and Thompson, Saunders
11   Primose SB, Molecular Biotechnology, Panima, 2001

Paper Code: 16GENO2   **FORENSIC SCIENCE**   **Credits: 3**

Internal Assessment Marks: 20

Time: 3hrs   **Max. Marks: 80**

Instructions

There will be a total of seven questions. Question No. 1 will be compulsory and shall contain ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining six questions will include two questions from each unit. Students will be required to attempt one question from each unit.

Unit –I

Forensic Science: Definition of Forensic Science, Role of the Forensic Laboratory, History and Development of Forensic Science in India, Branches of Forensic Science. Administration and Organizational Setup: Brief introduction to DFSS, CFSL, GEQD, SFSL, RFSL, MFSL, FPB, NICFS, CDTS, NCRB and BPR&D. Educational qualifications and employment in Forensic Science Laboratory.

Unit –II

Forensic Evidences: Concise of Forensic Physical, Biological, Chemical and Psychological Sciences, types of cases and evidences involved. Laws and Principles of Forensic Science: Law of Exchange (Locard), Law of Individuality, Law of Comparison, Law of Progressive Changes and Law of Probability. Criminalistics: Definition, Securing & Searching methods, Documentation of crime scene. Methods of collection of forensic evidences, Role of Police at the Crime scene, scientific help at crime scene, handling of various types of crime scenes by police.

Unit –III

Basics of signature and handwriting comparison, fake currency note examination. Classification of Fingerprint patterns, cases involved methods of development and comparison of fingerprints. Forensic expert, Admissibility of Forensic testimony in Court of law, Frye and Daubert standards, Cross Examination, Ethics in Forensic Science. Accreditation of Forensic laboratories by NABL.

Suggested Books:
1. James, S.H and Nordby, J.J. (2003) Forensic Science: An introduction to scientific and investigative techniques CRC Press,
2. Saferstein : Criminalistics (1976) Prentice Hall Inc., USA.
3. Sharma, B.R. (1974) Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
4. J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press

Open Elective: 16GEOO1

BASICS OF GEOINFORMATICS

Credit: 03 (3+0+0)

End Semester Exam: 80 marks

Internal Assessment: 20 marks

Total: 100 marks   Time: 3hrs

Learning Objectives

This course is designed to give students an exposure to basics of geospatial technologies. It offers to learn the techniques of generation and management of earth surface information. An inter and multi disciplinary approach has been used to make subject interesting and useful for students. Latest technology of GPS is included to understand use of modern day navigation and surveying.

Learning Outcomes

Students will be able to learn the use of latest geospatial technology. It will help them to understand the spatial phenomena in a better manner with availability of real time and accurate information. These technologies being modern and interdisciplinary in nature will enable the students to apply this knowledge in various fields of life**.**

Unit – I

Aerial Photography

Aerial photography: history and development, advantages and limitations; Classifications of aerial photographs; Geometry of an aerial photograph; Scale of an aerial photograph; Availability and procurement of aerial photographs in India; Aerial photograph vs map.

Unit – II

 Remote Sensing.

Introduction to Remote Sensing; electromagnetic radiation; stages of remote sensing; energy interactions in atmosphere; energy interactions with earth surface features and spectral signatures. Remote Sensing applications in land use/land cover, urban, environment, forest and disaster studies.

Unit – III

Remote Sensing

Remote Sensing platforms: airborne and space borne; satellite orbits: geostationary and near polar; Image data characteristics: resolutions- spatial, spectral, radiometric and temporal; Sensors and their types; Satellite missions of ISRO .

Unit – IV

GIS and GPS

Geographic Information System (GIS): definition and applications; GIS and remote sensing integration; components and elements of GIS; representation of earth surface features in GIS; introduction to Global Positioning System; GPS satellites constellations; GPS segments; Applications of GPS.

Note (i): Open Elective to be chosen from the basket of Open Electives (OEs) provided by the University.

(ii) The question paper will have five units. First four units of question paper will contain two questions from each unit. Candidate(s) are required to attempt one question from each unit. Unit-V shall be compulsory and shall contain eight short answer type questions covering entire syllabus. All questions carry equal marks.

Recommended Readings:

Paul Wolf, Bon DeWitt, and Benjamin Wilkinson. Elements of Photogrammetry with Application in GIS. USA: Mc-Graw Hill Education.2014.

Avery, T.E., and G.L. Berlin. Fundamentals of Remote Sensing and Airphoto Interpretation, Macmillan, New York.1992.

Campbell, J.B. Introduction to Remote Sensing, Guilford, New York.1996.

Curran, Paul J. Principles of Remote Sensing, Longman, London & New York. 1985.

Joseph, G. Fundamentals of Remote Sensing, Universities Press Hyderabad. 2005.

Lillisand, T.M. and P. W. Kiefer. Remote Sensing and Image Interpretation, New York. John Wiley & Sons.1986.

Burrough, P.A. and McDonnell, R.A. Principles of Geographic Information System. Oxford: Oxford   University Press. 1998.

Chang, Kang-tsung. Introduction to Geographic Information Systems. New Delhi: Tata McGraw-Hill.2006.

Doberstein, Dan. Fundamentals of GPS Receivers: A Hardware Approach. New York: Springer

ऑपन इलेक्टिव
भारतीय साहित्य – ।।।

Paper Code: 16HNDO1

समय : 3 घण्टे

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पूर्णांक : 100 अंक
आंतरिक मूल्यांकन : 20 अंक
लिखित परीक्षा : 80 अंक

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खण्ड क

भारतीय साहित्य की सैद्धांतिक अवधारणा
 भारतीय साहित्य का स्वरूप
 भारतीय साहित्य के अध्ययन की समस्याएं

खण्ड ख

पाठ्य विषय

  दीवान–ए–गालिब, संपा0–अली सरदार जाफरी, राजकमल प्रकाशन, नई दिल्ली।

(i)   निर्धारित गजलें :

ये न थी हमारी किस्मत	21
कोई उम्मीद बर नहीं आती	162
दिले नादां तुझे हुआ क्या है	163
हजारों ख्वाहिशें ऐसी	220

(ii)   रवीन्द्रनाथ की कहानियाँ (खण्ड ।), अनु0–रामसिंह तोमर, साहित्य अकादमी, नई दिल्ली

  पाठ्यक्रम में निर्धारित कहानियाँ–
  पोस्टमास्टर, काबुलीवाला, नष्टनीड़

(iii) 'खामोश अदालत जारी है' (नाटक) : विजय तेंदुलकर
(iv) संस्कार (उपन्यास) : यू0 आर0 अनंतमूर्ति

खण्ड ग

आलोच्य विषय

ग़ालिब की ग़ज़लों का काव्य–सौष्ठव
रवीन्द्रनाथ टैगोर की कहानियाँ–पाठ्यक्रम में निर्धारित कहानियों की मूल संवेदना एवं चरित्र
 चित्रण पर आधारित प्रश्न
'खामोश अदालत जारी है' : नाटक की मूल संवेदना, प्रमुख पात्रें का
        चरित्र–चित्रण, पितृसत्तात्मक व्यवस्था पर व्यंग्य,
        रंगमंच की दृष्टि से नाटक
संस्कार : उपन्यास का मूल प्रतिपाद्य, नामकरण, प्रमुख पात्रें का चरित्र चित्रण,
 उपन्यास का शिल्प–पक्ष

सहायक ग्रंथ :

1   बंगला साहित्य की कथा : हिंदी साहित्य – सुकुमार सेन, हिंदी साहित्य सम्मेलन प्रयाग सं0 2009
2   रवीन्द्र कविता कानन – सूर्यकांत त्रिपाठी निराला, राजकमल प्रकाशन, नई दिल्ली–1955
3   बंगला साहित्य का इतिहास, सुकुमारसेन, साहित्य अकादमी, नई दिल्ली–1970
4   फोर्ट विलियम कॉलेज, लक्ष्मीसागर वार्ष्णेय, इलाहाबाद विश्वविद्यालय, इलाहाबाद–1948
5   मध्यकालीन धर्म साधना, हजारीप्रसाद द्विवेदी साहित्य भवन, इलाहाबाद सं0 1013

निर्देश

1. खंण्ड क एवं ग में से छह आलोचनात्मक प्रश्न पूछे जाएंगे जिनमें से परीक्षार्थी को किन्हीं तीन प्रश्नों का उत्तर देना अनिवार्य है । प्रत्येक प्रश्न 20 अंक का होगा। (20x3 = 60)

2. खण्ड ख में चार अवतरणों में से परीक्षार्थियों को किन्हीं दो अवतरणों की संदर्भ सहित व्याख्या करनी होगी। प्रत्येक व्याख्या के लिए 10 अंक निर्धारित है। (10x2=20)

L-T-P
3-0-0

External Marks: 80
Sessional Marks: 20
Time Allowed: 3 Hours

FUNDAMENTALS OF MANAGEMENT
Course Code: 16IMSO1

Course Objective:
The objective of this course is to expose the students to basic concepts of management and to enable them to gain appreciation for emerging ideas, techniques, procedures and practices in the field of management.

Unit -I
Introduction: concept and nature of management; evolution of management thoughts – traditional, behavioural, system and contingency viewpoints

Unit -II
Planning, decision making and organizing: nature and elements of planning, planning types and models; strategic planning – an overview; basic issues in organizing – work specialization, chain of common delegation, decentralization, span of management, bases for departmentation

Unit -III
Leading: recognition of human factor, motivation models/approaches; leadership styles/behaviours, personal characteristics of effective leaders, leadership development

Unit -IV
Management control– concept and process, overview of control techniques, effective control system; evaluating corporate social performance; managing company ethics and social responsibility

Suggested Readings:
1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management , Pearson Education Asia, New Delhi
2. Hellreigel, Management, Thomson Learning, Bombay
3. Koontz, H and Wechrich, H; Management, Tata McGraw Hill
4. Stoner, J et. al, Management, New Delhi, PHI, New Delhi
5. Robbins & Coulter, Management, PHI, New Delhi
6. Satya Raju, Management – Text & Cases , PHI, New Delhi
1. Richard L. Daft, Management, Thomson South-Western

Instructions for External Examiner: The question paper shall be divided in two sections. **Section 'A'** shall comprise of eight short answer type questions from whole of the syllabus carrying two marks each, which shall be compulsory. Answer to each question should not exceed 50 words normally. **Section 'B'** shall comprise 8 questions (2 questions from each unit). The students will be required to attempt four questions selecting one question from each unit. All questions will carry equal marks.

L-T-P
3-0-0

External Marks: 80
Sessional Marks: 20
Time Allowed: 3 Hours

FUNDAMENTALS OF MARKETING
Course Code: 16IMSO2

Course Objective:
This course is designed to promote understanding of concepts, philosophies, processes and techniques of managing marketing operation and to develop a feel of the market place.

Unit -I
Nature and scope of marketing: corporate orientation towards marketplace; building and delivering customer value and satisfaction; retaining customers; marketing environment

Unit -II
Analyzing consumer markets and buyer behaviour; market segmentation, positioning and targeting; tools of product differentiation; marketing strategies in the different stage of the product life cycle

Unit -III
New product development process; product mix and product line decisions; branding decisions; pricing strategies; managing marketing channels; wholesaling and retailing

Unit -IV
Advertising and sales promotion; public relations; personal selling; evaluation and control of marketing effort; web marketing; green marketing

Suggested Readings:
1. Kotler Philip and Keller; Marketing Management; PHI, New Delhi
2. Kotler, Philip, Kevin Keller, A. Koshy and M. Jha, Marketing Management in South Asian Perspective, Pearson Education, New Delhi
3. Kerin, Hartley, Berkowtz and Rudelius, Marketing, TMH, New Delhi
4. Etzel, Michael J, Marketing: Concepts and Cases, TMH, New Delhi
1. Dhunna, Mukesh, Marketing Management – Text and Cases, Wisedom Publications, New Delhi

Instructions for External Examiner: The question paper shall be divided in two sections. **Section 'A'** shall comprise of eight short answer type questions from whole of the syllabus carrying two marks each, which shall be compulsory. Answer to each question should not exceed 50 words normally. **Section 'B'** shall comprise 8 questions (2 questions from each unit). The students will be required to attempt four questions selecting one question from each unit. All questions will carry equal marks.

MM: Th 80+IA 20

Time: 3 hours

NOTE FOR EXAMINER/PAPER SETTER

The question paper of each course will be divided into Five sections, each of the First Four Sections of the Question Paper will contain 2 questions respectively from Unit-1 to Unit-4 of the syllabus. The students will be required to attempt one question from each section. Section 5 of the question paper shall contain 8 short answer type questions of 3 marks each(without any choice) covering the entire syllabus. As such Section 5 will be compulsory. The examiner will be free to set the questions in problem forms based on case law.

NOTE FOR STUDENTS(ON QUESTION PAPER)

Attempt four questions from sections 1 to 4, selecting at least one question from each section. These questions shall carry 14 marks each. Section 5 is compulsory and each question in this section shall carry 3 marks.

UNIT-I
Preamble, Citizenship, Definition of State Under Art, 12. Rules of Interpretation under Art. 13
Leading Case: Mohmmad Raza V State of Bombay AIR 1966 , SC 1436

UNIT-II

Right to Equality(Art.14), Special Provision for Weaker Sections of the Society, Reservation Polity, Fundamental Freedoms under Art.19, Freedom of Press.
Leading Case: Indira Sawhney v Union of India, AIR 1993, SC 477

UNIT-III

Protection in respect of conviction of offcence (Act-20), Right to Life and Personal Liberty Article 21), Protection against Arrest and Detention (Art 22), Right against Exploitation (Art-23 & 24), Right to Religion (Art 25-28).
Leading Cases:Maneka Gandhi v Union of India, AIR 1978, SC 597

UNIT-IV
Cultural & Educational Rights of Minorities (Art.29 & 30), Right to Constitutional Remedies (Art, 32), Directive Principles of State Policy, Fundamental Duties.
Leading Case: T.M.A. Pai Foundation V State Karanataka AIR 2003 SC 355

BOOKS RECOMMENDED

Seervai, H.M.	:	Constitutional Law of India
Hidayatullah, M.	:	-do-
Tope, T.R.	:	-do-
Shukla, V.N.	:	-do-
Jain, M.P.	:	Constitutional Law
Chander Pal	:	Centre State Relations and Indian Cooperative Federalism
Chander Pal	:	State Autonomy in Indian Federation: Emerging Trends
J.N.Pandey	:	Constitutional Law of India

PAPER CODE: 16LAWO1
MM: Th 80+IA 20

Time: 3 hours

NOTE FOR EXAMINER/PAPER SETTER

The question paper of each course will be divided into Five sections, each of the First Four Sections of the Question Paper will contain 2 questions respectively from Unit-1 to Unit-4 of the syllabus. The students will be required to attempt one question from each section. Section 5 of the question paper shall contain 8 short answer type questions of 3 marks each(without any choice) covering the entire syllabus. As such Section 5 will be compulsory. The examiner will be free to set the questions in problem forms based on case law.

NOTE FOR STUDENTS(ON QUESTION PAPER)

Attempt four questions from sections 1 to 4, selecting at least one question from each section. These questions shall carry 14 marks each. Section 5 is compulsory and each question in this section shall carry 3 marks.

UNIT-I

Application of Hindu Law, Sources of Hindu, Schools of Hindu Law, Hindu Joint Family, Features of Mitakshra and Dayabhaga Joint Families, Coparcenary, Classification of Property, Karta of Joint Family, Position, Liabilities and Powers of Karta. Karta's powers of Alienation, Coparcener's Power of Alienation, Coparcener's Right to Challenge Improper Alienation, Alienee's Rights and Remedies

Leading Case: Harihar Prasad V Balmika Prasad AIR 1975 SC 733
           K.S. Subhiah Pillai V Commissioner of IT AIR 1999 SC 1220

UNIT-II
The nature and concept of Hindu Marriage, Evolution of the Institution of Marriage, The Hindu Marriage Act, 1955, Essential Conditions for Valid Hindu Marriage, Ceremonies of Marriage, Registration of Hindu Marriages, Remedy of Restitution of Conjugal Rights, Void and Voidable Marriages, Judicial Separation and Divorce, Various Types of Grounds for Divorce and Judicial Separation, Fair Trial Rule, Legitimacy of Children, Jurisdiction, Bars to Matrimonial Remedies, Ancillary Reliefs, Permanent Alimony and Maintenance, Custody etc.
Leading Case: Kailishwati V Ayudhia Parkash AIR 1977 PLR 216
           Naveen Kohli V Neelu Kohli, (2006) 4 SCC 558

UNIT-III
The Hindu Succession Act, 1956, Effects of the Hindu (Succession) Amendment, 2005, Rules of Succession to the Property of Hindu Male, Succession to the Property of Hindu Female, Succession to the Mitakshara Coparcener's Interest, General Rules of Succession, Partition, Subject Matter of Partition, Persons who have a Right to Partition & Right to Share, Persons who are entitled to Share, if, Partition takes place, Modes of Partition, How Partition is effected, Partial Partition, Reopening of Partition, Re-Union.

Leading Case: Raghuvamma V Chenchamma AIR 1964 SC 136
                Commissioner of Income Tax V Chandersen, AIR 1986 SC 1753

UNIT-IV
The Hindu Minority and Guardianship Act, 1956, Concept of Minority and Guardianship, Natural Guardians and their Powers, Testamentary Guardian: Appointment and Powers, Certified Guardian, Defecto Guardian, Guardian By Affinity, The Hindu Adoption & Maintenance Act, 1956, Nature of Adoption, Essential Conditions for Valid Adoption, Effects of Adoption, Registration of Adoption, Maintenance As Personal Obligation, Maintenance of Dependents, Quantum of Maintenance, Maintenance As a Charge on Property
Leading Cases: G. Appaswami Chettiar V R.Sarangapani AIR 1978 SC 1051
                Githa Hariharan V Reserve Bank of India(1999)2 SCC 228

BOOKS RECOMMENDED

Mulla	-	Principles of Hindu Law
Dr. Paras Diwan	-	Modern Hindu Law
Mayne's	-	Hindu Law and Usage
Dr. U.P.D.Kesari	-	Modern Hindu Law
Basant Kumar Sharma	-	Modern Hindu Law

Open Elective Course Offered by the Department of Library and Information Science

Sem	Course Code	Title of Course	Course Type	L-T-P	Marks			Duration	Credits
					Internal Assessment	Exam. Marks	Total Marks		
IInd	16LISO1	Academic Integrity and Plagiarism	O	3-0-0	20	80	100	3 Hrs	3
IIIrd	16LISO2	Information Sources and Literacy	O	3-0-0	20	80	100	3 Hrs	3

16LISO1: Academic Integrity and Plagiarism

MM: Th 80+IA 20
Time: 3Hrs.

Note
The paper is divided into 4 units. The candidates are required to attempt 5 questions in all selecting 1 question from each unit (out of two internal choices). Question 1 is compulsory consisting of 8 short answer type questions spread over the whole syllabus. All questions carry equal marks.

Objectives
- to know about academic integrity;
- to identify instances and types of plagiarism;
- to get awareness about plagiarism;
- to identify "fair use" applications to the use of someone else's materials;
- to find information about the correct way to cite a reference;
- to begin to develop your personal philosophy on academic integrity;
- to be cautious enough to have deterrence strategies of plagiarism.

Outcomes
The course enables the students to get awareness about the nature and practice of academic integrity and its advantages. Further the completion of the course will guide the students and others to have deterrence policies and strategies to get away from plagiarism activities. After completion of the course, the learners will come to know, how citations are made properly. Over all awareness will be developed to maintain academic honesty with practical examples by the trainers.

Unit 1: Academic Integrity

Academic Integrity: meaning, definition and concept
Reasons: Individual reputation, personal integrity, professional competence, status or standing of the institution
Original writings and contribution to society
Writings and Impact: good and original writings bring credibility; good impact factors; writings meant for the readers and society

Unit 2: Plagiarism

Plagiarism basics: meaning, definition and concept
Plagiarism: concept, need and importance, definitions; types
Copyright and fair use
Hoes does it occur: intentional and unintentional; innocence vs. deception

Unit 3: Plagiarism Deterrence

    Deterrence: avoidance, awareness
    Guidelines: summarizing, paraphrasing, direct quotations, language and vocabulary
    Citations: citation basics; citation styles: parenthetical and superscription
    Style manuals : Chicago, APA, MLA, Harvard

Unit 4: Measures, initiative and university agencies

    Research and Citation policies: formulation of research polices
    Regular trainings & awareness; role of librarians; handling online resources
    Anti-plagiarized software; Turnitin; I-authenticate; usefulness and limitations

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Suggested Readings

Cvetkovic, Vibiana Bowman & Anderson, Katie Elson (Eds.) (2010). *Stop plagiarism: a guide to understanding and prevention*. New York: Neel-Schuman.

Lampert, Lynn D. (2008). *Combating student plagiarism: an academic librarian's guide*. Oxford: Chandos.

Posner, Richard (2007). *The little book of plagiarism*. New York: Pantheon Books.

Roth, Lorie (1999). Educating the cut-paste generation. *Library Journal, 124*(18), pp.42-44.

Scalon, Patrick (2003). Student online plagiarism: how do we respond? College Teaching*, 51*(4): pp. 161-65.

Swain, N.K. Publish or perish: What the Indian policy makers think about it? *University News*, 52.15 (April 14-20, 2014): pp. 23-28.

16LISO2: Information Sources and Literacy

MM: Th 80+IA 20
Time: 3Hrs.

Note
The paper is divided into 4 units. The candidates are required to attempt 5 questions in all selecting 1 question from each unit (out of two internal choices). Question 1 is compulsory consisting of 8 short answer type questions spread over the whole syllabus. All questions carry equal marks.

Objectives
> to provide knowledge regarding information sources;
> to impart practical knowledge to the students about the evaluation of reference and information sources; and
> to make students aware about information literacy and search strategies

Outcomes
Through this course the students will come to know about the various types of information sources in print and electronic form. The students will have knowledge of various types of databases and how to evaluate them. After completion of the course, the students will know the importance of information literacy and various search strategies.

Unit 1: Information Sources

> Information sources and types : documentary and non-documentary
> Print information sources: primary, secondary, tertiary
> Electronic information sources: primary, secondary, tertiary
> Books: concept, parts: front matter, body, back matter; types
> Journals: concept, types, impact factor, h-index
> Theses: concept, parts

Unit 2: Databases

> Full text databases: Science Direct, Emerald
> Abstracting and indexing databases: Medline
> Citational databases: Scopus, Web of Science
> Theses databases: NDLTD, Shodhganga
> Open access resources: DOAJ, DOAB

Unit 3: Evaluation of Information Sources

> Evaluation criteria
> Evaluation of following information sources (print and electronic): dictionary: Oxford groups; encyclopedia: International Encyclopedia of Social Science, McGraw Hill Encyclopedia of Science & Technology ; biographical sources: International Who's Who; yearbook: World of Learning ;statistical sources: Census of India
> Evaluation of internet resources

Unit 4:Information Literacy

Information literacy: meaning, definition
Information literacy and lifelong learning
Nature of information requirement
Literature search
Search strategies and techniques

Suggested Readings

Eisenberg, Michael. *Information literacy: Essential skills for the information age*. 2nd ed. Westport Publ.: Libraries Unlimited, 2005.

Gates, Jean Key. (1988). *Guide to the use of Libraries and Information Sources* (6thed). New York: McGraw-Hill.

Katz, William A. (2002). *Introduction to Reference Work: Basic Information Services. Introduction to Reference Work:* V1. 8thed. New York: McGraw-Hill, 2002.

Katz, William A. (2002). *Introduction to Reference Work: Reference Services and Reference Processes*. V2. 8thed. New York: McGraw-Hill.

Open Electives to be offered by Department of Mathematics w.e.f. Even Semester of Session 2016-17

Course Code	Title of the Course	Theory Marks	Internal marks	Practical Marks	Credits (L:T:P)
To be offered in Even Semester					
16MATO1	Mathematical Techniques and Applications	80	20	--	3:0:0
16MATO2	Parametric and Non-Parametric Tests	80	20	--	3:0:0
To be offered in Odd Semester					
16MATO4	MATLAB	40	--	60	1:0:2
16MATO3	Statistical Tools using SPSS	50	--	50	2:0:1

16MATO1: Mathematical Techniques and Applications
(To be offered in Even Semester)

Time: 03 Hours
MM. Th 80+IA 20
Time: 2 h
Credits   : 3:0:0

Section - I
Idea of Real Number System, Sets, Relations and functions.
Solutions of linear and quadratic equations; Logrithms and Exponents. Trigonometric functions.

Section - II
Concepts of limit, Continuity and Differentiation. Slope of a straight line.
Increasing and Decreasing functions, Maxima and Minima.

Section - III
Integration - Simple techniques including integration by substitution and by parts for algebraic, exponential and logarithmic functions, Definite integrals. Differential Equation-Solution of first order linear differential equation.

Section - IV
Measures of Central Tendency and Dispersion. Linear Correlation and Regression.

Note : The question paper will consist of **five** units. Each of the first four units will contain **two** questions from unit **I , II , III , IV** respectively and the students shall be asked to attempt **one** question from each unit. Unit five will contain **eight to ten** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**.

Books Recommended:
1.   Maurice, Weir D., Hass J., Frank, Giordano R., Thomas' Calculus, Pearson.
2.   Strang, G., Calculus, Wellesley-Cambridge Press.
3.   Heinbockel, J.H., Introduction to Calculus, Vol - 1.,
      http://www.math.odu.edu/~jhh/Volume-1.PDF
4.   Goon, A.M, Gupta, M.K and Dasgupta, B, Basic Statistics, World Press.
5.   Gupta, S.P, Statistical Methods, Sultan Chand & Sons, New Delhi.

16MATO2: Parametric and Non-Parametric Tests
(To be offered in Even Semester)

Time: 03 Hours
MM. Th 80+IA 20
Time: 2 h
Credits   : 3:0:0

Section - I
Parameter and Statistic: Sampling distribution of a statistic, standard error and its utility.
Tests of significance: Null and alternative hypotheses, Two types of error, Critical region and level of significance, One-tailed and two-tailed tests, Critical values, Procedure for testing of hypothesis.

Unit -II
Large Sample Tests: Tests of significance for single proportion and single mean, for difference of two proportions, two means and two standard deviations, related confidence intervals for population parameters. Chi-square tests for goodness of fit, Test of independence of attributes.

Unit -III
t-test for single mean, difference of means, F-test for equality of two population variances, related confidence intervals. Applications of ANOVA for one-way and two-way classified data.

Unit -IV
Non-parametric tests: Advantages and drawbacks of non-parametric tests over parametric tests, One sample and two sample sign tests, Median test, Wilcoxon-Mann-Whitney test, One sample runs test, Spearman rank correlation test.

Note : The question paper will consist of **five** units. Each of the first four units will contain **two** questions from unit **I , II , III , IV** respectively and the students shall be asked to attempt **one** question from each unit. Unit five will contain **eight to ten** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**.

Books Recommended:
1. Mood, A. M., Graybill, F. A. and Boss, D. C., Introduction to Theory of Statistics, McGraw-Hill.
2. Goon, A. M., Gupta, M. K. and Das Gupta, B., Basic Statistics, World Press.
3. Gupta, S.C. and Kapoor, V. K., Fundamentals of Mathematical Statistics, S. Chand Pub., New Delhi.
4. C. R. Kothari, Research methodology, New Age International Publishers.

16MATO3: Statistical Tools using SPSS
(To be offered in Odd Semester)

Time: 03 Hours   *Max Marks   : T50+P50*
                                    Credits   : 2:0:1

Unit – I
Data: Qualitative and Quantitative Data, Cross-Sectional and Time series data, Univariate and Multivariate data. Scales of measurement of Data.
Frequencies, Bar charts, Pie Charts, Line Graphs, histograms, Measures of central tendency, dispersion, Skewness, Kurtosis, Box plots.

Unit – II
Concepts of Linear Correlation and Regression, Multiple Regression, Normality tests, t-tests, Chi Square tests, F-test, One way and Two way ANOVA.

Unit – III
SPSS Data File: Opening a data file in SPSS, SPSS Data Editor, Creating a data file, Editing and Manipulating data, Missing Values, Editing SPSS Output, Copying SPSS output, Printing from SPSS, Importing Data.
Charts and Graphs with SPSS: Frequencies, Bar charts, Pie Charts, Line Graphs, histograms,

Unit – IV
Descriptive Statistics with SPSS: Measures of central tendency, dispersion, Skewness, Kurtosis, Box plots.
Statistical tests using SPSS, Correlation and Regression using SPSS, Factor analysis using SPSS.

Note : The question paper will consist of **five** units. Each of the first four units will contain **two** questions from unit **I , II , III , IV** respectively and the students shall be asked to attempt **one** question from each unit. Unit five will contain **eight to ten** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**.

Books Recommended:
1. Kothari, C.R., Research Methodology
2. Gupta, S.L. and Gupta, Hitesh, SPSS for Researchers, International Book House Pvt. Ltd.
3. Field, A., Discovering Statistics using SPSS, SAGE Publications.
4. Gupta, V., SPSS for Beginners, VJ Books Inc.
5. Rajathi, A. and Chandran, P., SPSS for you, MJP Publishers

Part-B (Practical)

   Time: 03 Hours   *Max Marks   : 50*

There will be a separate practical paper based on the above theory paper. All practicals are required to be done using SPSS.

16MATO4: MATLAB
(To be offered in Odd Semester)

Time: 03 Hours   *Max Marks   : T40+P60*
                                                    Credits   : 1:0:2

Section - I
Introduction to MATLAB Programming: Basics of MATLAB programming, Anatomy of a program, variables and assignments, data types, operators, working with complex numbers, mathematical operations, functions for input and output, good programming style.

Section - II
Introduction to vectors in Matlab: Defining a Vector, Accessing elements within a vector, Basic operations on vectors, strings, string functions, cell array, creating cell array, Introduction to Matrices in Matlab: Defining Matrices, Matrix functions, Matrix operations, vector functions

Section - III
Loops: for loops, while loops, Branching (conditional statements) - if statement, if else statement, else if statement, Executable files, subroutines, Built in functions and user-defined functions, function handles, function handles in m-files, inline functions.

Section - IV
Data files: Saving and recalling data, saving a session as text, C style read/write, Graphs and plots- Polar plot, plot3, mesh, contour, contourf, Using built-in algorithms: optimization and numerical integration (areas), Root-finding.

Note : The question paper will consist of **five** units. Each of the first four units will contain **two** questions from unit **I , II , III , IV** respectively and the students shall be asked to attempt **one** question from each unit. Unit five will contain **eight to ten** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**.

Books Recommended:
1. MATLAB An Introduction With Applications 5ed, Author: Amos Gilat. Publisher: Wiley, ISBN13:. 978-1118629864.
2. Insight Through Computing: A Matlab Introduction to Computational Science and Engineering by C. F. Van Loan and K.-Y. D. Fan. SIAM Publication, 2009, ISBN: 978-0-898716-91-7.
3. MATLAB Programming, Y.Kirani Singh, B.B. Chaudhari, PHI Learning, 2007, ISBN 8120330811, 9788120330818.
4. An Introduction to Matlab, Krister Ahlersten, Bookboon.com, ISBN: 978-87-403-0283-7

Open Elective: 16MCBO1: Microbial World: Diversity and applications *Time: 03 Hours*
MM. Th 80+IA 20
Time: 2 h
Credits : 3:0:0

Note: The question paper will consist of 9 questions. Students will have to attempt 5 questions in total - Question no. 1 will comprise of short answer questions covering the entire syllabus and will be compulsory. Two questions to be set from each Unit and students will have to attempt one from each Unit.

Unit – I
Systematics&Biodiversity:Classification and nomenclature of microorganism.Salient featuresof different groups: Acellularmicroorganisms (Viruses,Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi andProtozoa) in reference to their distribution and occurrence, morphology, mode ofreproduction and economic importance.

Unit – II
Characteristics of extremophiles:Thermophiles, Methanophiles, Alkalophiles, Acidophiles, Halophiles and Barophiles: Classification, habitats, ecological aspects andapplications.

Unit – III
Microbiological techniques:Preparation of culture media, Pure culture isolation; cultivation,maintenance and preservation/stocking of pure cultures; cultivation of anaerobicbacteria, and accessing non-culturable bacteria. Physical and Chemical methods for the control of microorganisms

Unit – IV
Scope of Microbiology:Role of microorganisms in Food industry, Pharmaceutical industry, Production ofIndustrial enzymes, Agriculture: bio-fertilizers, bio-pesticides. Environment:bioremediation, bioleaching

Suggested readings:

1.   Brock TD., Milestones in Microbiology, Infinity Books.
2.   Pelczar M.J., Chan E.C.S. & Kreig N.R., Microbiology: Concepts and Application.,Tata McGraw Hill.
3.   Stainier RY, Ingraham JL, Wheelis ML & Painter PR General Microbiology, Publisher: MacMillan.
4.   Madigan M.T., Martinko J.M. and Parker J., Brock Biology of Microorganisms: Prentice-Hall ,   Inc USA.
5.   Atlas R.M., Principles of Microbiology, Wm C. Brown Publishers.
 6. Vandenmark P.V. and Batzing B.L., The Microbes – An Introduction to their nature and Importance: Benjamin   Cummings. Microbiology

Open Elective: 16MCBO2 : Microbial Technology for Entrepreneurship

Time: 03 Hours
MM. Th 80+IA 20
Time: 2 h
Credits : 3:0:0

Note: The question paper will consist of 9 questions. Students will have to attempt 5 questions in total - Question no. 1 will comprise of short answer questions covering the entire syllabus and will be compulsory. Two questions to be set from each Unit and students will have to attempt one from each Unit.

Unit I

Commercial Microbial Products; Introduction to bioprocess development- upstream development, downstream process, Preservation and improvement of industrially important microorganisms, Strain development by mutagenesis, protoplast fusion and Genetic engineering.

Unit II

Raw materials and media formulation for microbial culture; batch, fed batch and continues mode of bioprocess, Types of Bioreactors and their applications: Stirred tank bioreactor & Specialized bioreactors.

Unit III

Downstream process, Choice of bioprocess plant location; Methods of estimation of Capital Cost and Operational costs of bioprocess plant, Good Lab Practices (GLP) and Good Manufacturing Practices (GMP).

Unit IV

Introduction to Bioentrepreneurship; Factors necessary for Entrepreneurship; Attributes in an Entrepreneur; Market Assessments; Managing Technology transfer and Intellectual property in biotechnology in India, Licensing of Biotechnological invention, Funding agencies in India, Basics of Patents- Types of patents; Filing of a patent application.

Suggested readings:

1. Handbook of Bioentrepreneurship by **Patzelt**, Holger, **Brenner**, Thomas (Eds.) Publisher:
2. SpringerBiotechnology. A Textbook of Industrial Microbiology, by W. Crueger and A. Crueger. Publisher: Sinauer Associates.
3. Industrial microbiology by G. Reed, Publishers: CBS
4. Bioprocess Engineering Principles by P. Doran. Publisher: Academic Press.

Biochemical Engineering Fundamentals by J.E. Baily and D.F. Ollis. Publisher: McGraw Hill

PAPER CODE: 16PHYO1

Theory Marks: 80
Internal Assessment: 20
Time: 3 hours

Unit I
Introduction
Limitation of conventional energy sources, need and growth of alternative energy sources, basic scheme and application of direct energy conservation.
Solar Cells:
Solar energy: Introduction, The characteristics of the sun, Definitions related to solar radiations, solar radiation geometry, Estimation of daily solar radiation. Theory of solar cells. Solar cell materials, solar drying, solar furnaces, Solar cooking, solar green house technology, solar thermal power generation, solar cell array.

Unit II
Solar Thermal Energy:
Solar radiations, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Unit III
Geothermal Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental consideration, estimates of geothermal power, nature of geothermal fields, advantages & disadvantages of geothermal energy forms, applications of geothermal energy. Geothermal power plant.
Fuel Cells:
Principle, working of various types of fuel cells, performance and limitations.

Unit IV
Wind Energy:
Wind power and its sources: Principle of working of Wind Energy, performance and limitations of energy conversion systems. Site selection, criteria, momentum theory, wind characteristics.

Text / References Books:
1. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
2. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
3. D.S. Chauhan, "Non-Conventional Energy Resources" New Age International.
4. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
5. Peter Auer, "Advances in energy system and Technology" Vol I & II Edited by Academic Press.
6. G.D. Rai, "Non-conventional Energy sources" Khanna Publishers
7. Raja A.K., "Introduction to Non-Conventional Energy Resources" Scitech Publications.
    Fahrenbruch and Bube, "Fundamentals of Solar cells. Photovoltaic Solar Energy"

PAPER CODE: 16PHYO2

Theory Marks: 80
Internal Assessment: 20
Time: 3 hours

Unit I
Bio-mass:
Introduction of biogas, Availability of bio-mass and its conversion theory, classification of biogas plants, principle & working of floating drum plant & fixed dome type plant- advantages & disadvantages. Biogas from plant waste, community biogas plants, utilization of biogas.

Unit II
Ocean Thermal Energy Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle, working, performance and limitations.

Unit III
Petroleum and Coal energy
Petroleum, origin, composition, production, extraction, octane number, kerosene, LPG, lubricants natural gas, physical properties and uses of coal, generis of coal, molecular structure, determination of fixed carbon content, coal for generation of electricity, zero emission power plants, coal reserves and mining.

Unit IV
Nuclear Energy
Nucleus and its constituents, charge mass, isotopes, isobars, mass defect, binding energy and nuclear stability, radiation and nuclear reactions.
Nuclear fission, chain reaction, U^{235}, U^{238}, controlled nuclear fission and nuclear reactors, fast breeder reactor, nuclear fusion, condition for nuclear fusion reaction, Hydrogen bomb, Nuclear bomb

Text / References Books:
1. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
2. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
3. D.S. Chauhan, "Non-Conventional Energy Resources" New Age International.
4. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
5. Peter Auer, "Advances in energy system and Technology" Vol I & II Edited by Academic Press.
6. Raja A.K., "Introduction to Non-Conventional Energy Resources" Scitech Publications.
7. G.D. Rai, "Non-conventional Energy sources" Khanna Publishers

Journalism and Mass Communication

(Open Elective) [for students of other Dept.)
16JRMO1
MEDIA & SOCIETY
2nd/3rd Semester

Marks: 100
Credits: 3:0:0   **Theory Marks: 80**
Time Allowed: 3 Hours   **Internal Assessment Marks: 20**

Unit I

1. Media Definition
2. Relationship of Media in Society
3. Impact of Media on society- recent trends
4. Media and Social Development

Unit II

1. Media Literacy
2. Impact of Media on children and youth
3. Media and gender issues
4. Media and Rural Society

Unit III

1. Media and Violence
2. Media and Rising Crime
3. Media and Democracy
4. Media and development of Scientific temperament
5. Media and environmental issues

Unit IV

1. Media accountability

2. Media and Economic development
3. Media and Nation building
4. Popular culture and media

SYLLABUS FOR OPEN ELECTIVE (SANSKRIT)

Ancient Indian Culture and Philosophy

(प्राचीन भारतीय संस्कृति एवं दर्शन)

16SKTO1

2nd/3rd Semester

Maximum Marks: 100
Credits: 3:0:0   **Theory Marks: 80**
Time Allowed: 3 Hours   **Internal Assessment Marks: 20**

Unit I :	General Study of Ramayana and Mahabharta	-	20
घटक एक :	(रामायण व महाभारत का सामान्य अध्ययन)		
(i)	General Introduction (सामान्य परिचय)		
(ii)	Recenssions (संस्करण)		
(iii)	Society (समाज)		
(iv)	Family Relations (पारिवारिक सम्बन्ध)		
(v)	Education (शिक्षा)		
(vi)	Politics (राजनीति)		
(vii)	Economy (अर्थव्यवस्था)		
(viii)	Situation of Women (स्त्रियों की दशा)		
Unit II :	Vidurniti	-	20
घटक दो :	(विदुरनीति)		
Unit III :	Śrimadbhagavad Gītā – Chapters I to III	-	20
घटक तीन	श्रीमद्भगवद्गीता : अध्याय – एक से तीन		
Unit IV :	Yoga Philosophy	-	20
घटक चार	योग दर्शन		

(i) General Introduction to Yoga – Citta, Vrtti, Iśvara

योग दर्शन का सामान्य परिचय – चित्त, वृत्ति, ईश्वर

(ii) Yoga for Social Health – Maitri, Karunā, Muditā, Upekshā, Yama

योग एवं सामाजिक स्वास्थय – मैत्री, करुणा, मुदिता, उपेक्षा, यम

(iii)   Yoga for physical health – Niyama, Āsana, Prānāyāma

योग एवं शारीरिक स्वास्थ्य – नियम, आसन, प्राणायाम

(iv)   Yoga for mental health – Pratyāhāra, dhāranā, dhyāna, samādhi.

योग एवं मानसिक स्वास्थ्य – प्रत्याहार, धारणा, ध्यान, समाधि

Guidelines :   Students will be required to attempt five questions of 16 marks each.

Question no. 1 will comprise eight short answer type questions from all Units. Guidelines for other Four questions are as under.

दिशा निर्देश –

Unit I   :   One critical question out of two

Or

two short notes out of four.   16

Unit II   :   One critical question out of two

Or

two short notes out of four.   16

Unit III :   One critical question out of two

Or

two short notes out of four.   16

Unit IV :   One critical question out of two

Or

two short notes out of four.   16

Recommended Books (अनुशंसित ग्रन्थ) :

1.   रामायण – गीता प्रेस गोरखपुर

2.   महाभारत – गीता प्रेस, गोरखपुर

3. Srimad Valmikiya Ramayana with Commentaries in 6 Vols. भारतीय विद्या प्रकाशन, जवाहर नगर, दिल्ली – 7

4. Srimad Mahabharatam Ed. by T.R. Krishnacharya – Indian Book Centre, Sri Satguru Publications, 24/4, Shakti Nagar, Delhi.

5. Valmiki Ramayana me Varnit Arthik Jeevan – Kaveri Book Service

6. Valmiki Ka Rajdharma – Kaveri Book Service

7. श्रीराम के युग का तिथि निर्धारण : पुष्कर भटनागर, मा ीलाल बनारसी दास, दिल्ली

8. Politics and Ethics in Ancient India (As depicted in Mahabharta) : M. Jauhari – भारतीय विद्या प्रकाशन, जवाहर नगर, दिल्ली

9. Religion and Society in Ancient India : Om Parkash - भारतीय विद्या प्रकाशन, जवाहर नगर, दिल्ली

10. रामायणकालीन समाज एवं संस्कृति : जगदीश चन्द्र भट्ट – भारतीय विद्या प्रकाशन, जवाहर नगर, दिल्ली

11. Vidurniti by Swami Jagdishwaranand – Kaveri Book Service

12. श्रीमद्भगवद्गीता – गीता प्रेस, गोरखपुर

13. A Bhagavad Gita : Kappuswami – चौखम्बा आरियण्टालिया, दिल्ली

14. ikr×tyयोगसूत्रम् (व्यासभाष्यम्) – व्या० ब्रह्मलीनमुनि

15. ikr×tyयोगसूत्रम् – व्या० सुरेशचन्द्र श्रीवास्तव्य

16. ikr×tyयोगसूत्रम् – व्या० हरिहरानन्द आरण्य

17. व्याख्याकारों की दृष्टि में ikr×tyयोग दर्शन – विमला कर्णाटक

18. The Yoga System of Patanjali – J.H. Woods.

19. Essence of Yoga – Reflections on the Yoga Sutras of Patanjali by Bernard Bauan Chand – Indian Book Centre, Sri Satguru Publications, Delhi.

20. Meditative Yoga : Integrating Body, Breath and Mind by Are Holen and Terbojrn Hobbel : Motilal Banarsidass, Delhi.

21. The Art and Science of Raja Yoga by J. Donald Walters : Motilal Banarsidass, Delhi.

Quantitative Techniques (2nd Semester)

Paper Code: 16STAO1

Section –I

Classification of Data, variable and measurement scales. Presentation of Data. Measures of Central Tendancy and Dispersion, Skewness and Kurtosis. Measures of Association of Attributes. Correlation and Regression. Principle of Least Squares , Multiple and Partial correlation. Fitting of Polynomial and Exponential Curves.

Section –II

Random variables. Probability mass function, Probability density function and Commulative distribution function. Expectation and its properties. Moments, moment generating function and probability generating function. Discrete Probability distributions: Bernolli, Bionomial, Poisson, Negative Binomial, Geometric and Uniform. Continuous Probability distributions: Normal, Exponential, Log Normal and Uniform, Fitting of Bionomial, Poisson and normal distribution.

Section –III

Index numbers: Types, uses and their construction. Cost of living index numbers. Test of adequacy of Index numbers.
Time Series: Components and Models of time series. Measurements of trend and seasonal indices, Forcasting and Estimation.

Section –IV

Statistical Quality Control. Purposes and construction of control charts for variables and attributes using 3 sigma limits and 6 sigma limits. Single and double Sampling Inspection plans. Natural tolerance limit and modified control limits.
Vital statistics: Methods of obtaining Demographic data, Measurement of Mortality and Fertility. Complete Life and Abridged Life Tables.

Books Recommended

1. Goon, A.M., Gupta, M.K. and Dasgupta, B.   :   Outline of Statistics Volume-I & II
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.   :   Fundamental of Statistics Volume-I &II
3. Rohtagi, V. K. and Md. Ehsanes Saleh, A. K.   :   An Introduction to Probability and Statistics
4. Mood, A.M., Graybill, F.A. and Boes, D.C.   :   An Introduction to Theory of Statistics
5. Croxton, F.E. and Cowden, D.J.   :   Applied General Statistics
6. Kendall S.M. and Stuart A.   :   The Advanced Theory of Statistics

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C & D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.

Sampling and Estimation Techniques

PAPER CODE: 16STAO2

Maximum Marks-80
Internal Assessment Marks—20
Time:-03 Hours
Credit: 03

Section –I

Population, sample, sampling distribution, standard error. Testing of Hypotheses: Simple and composite hypotheses, Null and alternative hypotheses, two types of errors, critical region and level of significance, one tailed test, two tailed test, Test of significance (Single and two samples problems) for normally distributed data. Goodness of fit test.

Section –II

Sample versus Complete Enumeration. Designing of Sample Surveys, Sources of Errors in Sample Surveys, Types of Non-Response Errors.
Probability and Non-probability Sampling: Simple Random Sampling with and without replacement for the estimation of Mean and Total, Determination of Sample Sizes of specified precision.

Section –III

Stratified Sampling: Proportional and Optimum Allocation, Estimation of gain due to stratification, Construction of strata, Determination of number of strata. Systematic, Cluster and Probability Proportional to Size Sampling. Comparison of stratified sampling with simple random sampling.

Section –IV

Analysis of Variance: one- way, two -way (with one and multiple but equal number of observations per cell). Completely Randomized Designs, Randomized Block Designs and Latin Square Designs.
Factorial Experiments: Definition, Estimation of factor's effect, Analysis of the factorial experiments, Confounding: complete and partial confounding.

Books Recommended

1.	Mood A.M., Graybill, F.A. & Boes, D.C.	:	Introduction to the Theory of Statistics
2.	Goon, A.M., Gupta, M.K. and Dasgupta, B.	:	Fundamental of Statistics, Vol-II
3.	Singh D. & Chaudhary F.S.	:	Theory & Analysis of Sample Survey Designs
4.	Mukhopadhyay, Primal	:	Theory and Methods of Survey sampling
5.	Dass, M.N. and Giri, N.C	:	Design and Analysis of Experiments

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C & D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.

Optimization Techniques (3rd Semester)

PAPER CODE: 16STAO3

Maximum Marks: 80
Internal Assessment Marks: 20
Time: 3 Hours
Credit: 03

Section –I
Linear Programming Problems: Formulation and their Solution by Simplex and Artificial Variable Techniques. Resolution of Degeneracy in LPP. Duality in LPP: Solution of Primal-Dual Problems by Dual Simplex Method and Economic Interpretation of Duality. Solutions of Integer Programming Problems (IPP).

Section –II
Transportation Problems: Mathematical Formulation and their Optimal Solution. Assignment Problems: Mathematical Formulation and their Solution by Hungarian Assignment Method.
Theory of Games: Characteristic of Games, Minimax (Maximin) Criterion and Optimal Strategy. Solution of Games with (or without) Saddle Point. Solution of mxn Games by Linear Programming Method. Principle of Dominance.

Section-III
Markov Chains: Classification of States and Chains. Higher Transition Probabilities. Elementary Idea of Birth and Death Processes. Queuing Theory: Description of Queuing Problems, Notations, Measures of Effectiveness and Characteristics. Queuing Systems: M/M/1, M/M/C, M/M/1/R, M/G/1 and G/M/1 Models with Waiting Time Distribution and their Steady State Solutions.

Section –IV
Inventory Problems**:** Classification and Cost involved in Inventory Problems. Solution of Deterministic and Probabilistic Inventory Models. Job Sequencing Problems: Processing of N Jobs through Two, Three and M Machines. PERT and CPM Techniques. Labeling Time Estimate and Determination of Critical Path on Network Analysis.

Books Suggested:
1.   Gass, S.I.   : Linear Programming (Methods and Applications)
2.   Kambo, N.S   : Mathematical Programming Techniques
3.   Hadely,G.   : Linear Programming
4   Medhi, J.   : Stochastic Processes (New Age International)
5.   Donal, Gross & Carl, M. Hariss : Fundamentals of Queuing Theory (Wiley)
6.   Kashyap, B.R.K &   : An Introduction to Queuing Theory (A.A.Publications)
       Chaudhary, M.L.
7.   Churchman   : Introduction to Operations Research (J. Wiley)
8.   Sharma, S.D.   : Operation Research (Kedar Nath Ram Nath, India)

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C& D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.

DEPARTMENT OF ZOOLOGY
M. Sc. ZOOLOGY

Semester- II

Course no.: 16ZOOO1
Course Title: Applied Zoology

MM:T80+IA20

Time: 3 Hr

Note: There shall be seven questions in total. One question will be compulsory (short answer type) covering the entire syllabus and remaining six questions will be set two from each unit. Students are required to attempt compulsory question and 04 more questions selecting at least selecting one from each unit.

Unit-I
Host – Definitive and intermediate, Parasitism, Symbiosis, Commensalism, Reservoir.
Transmission, prevention and control of diseases: Tuberculosis and Swine flu
Principles and applications of ECG, MRI, PET, and CAT.

Unit-II
Life history and pathogenesis of *Plasmodium* sp.
Life history, Medical importance and control of *Aedes* sp.
Life history, pathogenesis and control of *Taenia* sp.
Principles and applications of brain activity recording, and pharmacological testing.

Unit-III
Preservation of gametes in animal and artificial insemination.
Principles and management of Poultry.
Introduction and management of pisciculture
Genetic improvement in animals; Induced breeding in aquaculture.

*As per SOE Zoology
** Proposed maximum marks and subject to change in uniformity with other faculties of university

List of Recommended Books

1. Dent, D. Insect Pest Management
2. Hill, D.S., Timber Press. Agricultural Entomology
3. David, B. V. & Ananthakrishnan. General and Applied Entom
4. ology . T. N., Tata
   McGraw-Hill Publishing.
5. Asa C. Chandler, Clark P. Read, Introduction to Parasitology, John wiley and Sons., Inc., New York.
6. Thomas W.M. Cameron, Parasites and Parasitism, Billing and Sons ltd. London,
7. Elmer R. Noble, Glenn A. Noble; Parasitology: The Biology of Animal Parasites, Lea and Febiger, Washington.
8. R.P. Hall, Protozoology, Prentice-Hall, Inc. Engtewood diffs. N.J. Charles E. Tuttle Company, Tokya
9. E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northern & Co.
10. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. Garland Publishing Inc., New York.
11. Molecular Biology and Biotechnology. A comprehensive desk reference, R.A. Meyers (Ed.), VCH Publishers, Inc., New York.
12. Molecular Cloning: a Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press, New York.
13. Gray's Clinical Neuroanatomy by Mancall **New** Medical Pharmacology at a Glance (7th Ed.)
14. Oxford Handbook of Neurology (2nd Ed.)

Course no.: 16ZOOO2
MM:T80+IA20

Time: 3 Hr

Note: There shall be seven questions in total. One question will be compulsory (short answer type) covering the entire syllabus and remaining six questions will be set two from each unit. Students are required to attempt question 1 and 4 more selecting at least one from each unit.

Unit-I
Wildlife: Definition, significance and wildlife zones of the world and India, Protected Area Systems, Present status of National PA-Systems. Theory and Practice of Biosphere Reserves of the world: Biosphere Reserves of India. Natural Heritage sites, Wildlife and livelihood; Wildlife and illegal trade & control.

Unit-II
Wildlife Damage, electric fences for wildlife damage control, Basic electric fence design, Trench design, line trapping, Mist netting, Rocket netting Chemical capture: Equipment, Drugs, Plan of operation. Poaching: Its implications, conducting anti-poaching operations.

Unit-III
Wildlife conservation techniques, role of WWF, IUCN, UNEP, Red Data Book; Categories of Endangered Wildlife Species. National Projects: Project Tiger, Project elephant, Project Rhinoceros, Project Crocodiles.

*As per SOE Zoology
**proposed maximum marks and subject to change in uniformity with other faculties of university

List of Recommended Books
1. Techniques for wildlife Census in India by W.A. Rogers (A field mannual); Wildlife   Institute of India, Dehradun.
2. Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL Wattenslip,Pratunam Bangkok, 10400, Thailand
3. Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay.
4. The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay.
5. Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun.
6. E.P. Gee, The Wildlife of India.