

**Guidelines for Courses
in Emerging Areas
including Schemes for
Computer Centre and PG Fellowship for
M.E./M. Tech Students and Scheme for
Computer Applications
Paper at PG Level**

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**UNIVERSITY GRANTS COMMISSION
NEW DELHI
1993**

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in Emerging Areas
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Computer Centre and PG Fellowship for
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Paper at PG Level**

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**UNIVERSITY GRANTS COMMISSION
NEW DELHI
1993**

University Grants Commission

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UNIVERSITY GRANTS COMMISSION
(Applicable for all schemes/programmes of UGC)
UTILISATION CERTIFICATE IN RESPECT OF ITEMS/PROGRAMMES
WHICH ARE IN PROGRESS/COMPLETE

It is certified that the University Grants Commission sanctioned Rs. _____ lakhs
 (Rupees _____) vide letter No. F. _____ dated _____
 for _____ (name of programme/item) which is under implementation/ has been
 completed. It is certified that the progress of expenditure on the programme/item is as under:

A. Non-Recurring:

Sf. No.	Item (s)	Cost approved by the UGC	Grant released by UGC so for	UGC Sanction Letter No. & date for each item	Actual expenditure as on _____ (date)	Remarks
---------	----------	--------------------------	------------------------------	--	---------------------------------------	---------

1.

2.

3.

B. Recurring:

Sl. No.	Item (s)	Cost approved by the UGC	Grant released by UGC so for	UGC Sanction Letter No. & date for each item	Actual expenditure as on _____ (date)	Remarks
---------	----------	--------------------------	------------------------------	--	---------------------------------------	---------

1.

2.

3.

A. This certificate is based on audited/unaudited statement of expenditure.

B. This item of stock have been in the assets ledger/ register of the institution.

Signature:

Name:

Designation:

(Resolution No. _____ dated _____ of University/ Executive Body authorising the above signatory to furnish utilisation certificate.

UNIVERSITY GRANTS COMMISSION
(Applicable for all schemes/programmes of UGC)
PROFORMA FOR SUBMITTING UTILISATION CERTIFICATE IN RESPECT OF
BUILDINGS WHICH IS COMPLETED

It is certified that _____ (specify the name of the building) which was approved by the University Grants Commission, vide its Letter No. F. _____ dated _____ and revised (final) estimate was approved vide UGC Letter No. F. _____ dated _____ has been completed. The details of expenditure on the above building are as under

Original estimated cost as approved by UGC	UGC Letter No. date	Final Revised estimated cost as approved by UGC	UGC Letter No. date	Total share of UGC against the final revised estimate
(Rs. in lakhs)		(Rs. in lakhs)		(Rs. in lakhs)

It is further certified that the above expenditure has been incurred as per details given below :

1. Cost of site development including landscaping, approach road, plantation etc
2. Cost of Civil works
3. Cost of Electrical wiring & fittings.
4. Cost of water supply, sewerage, sanitary fittings.
5. Cost of furnishing & furniture.
6. Any other (specify)
7. Supervision charge of construction agency.

GANTD TOTAL:

Certificate of Engineer:

Certified that the building has been completed as per plans & estimates approved by UGC.

1. This certificate is based on audited/ unaudited statement of expenditure.
2. Certified that the building & fittings/ furnishing have been taken on university college assets, stock ledger register.

Signature of the competent authority:

Full Name:

Designation:

(Resolution No. _____ dated _____ of University/ or Executive Body authorising the signatory to furnish utilisation certificate.

Remarks: If the building is constructed by an architect (either individual or a firm) the certificate of a completion cost is to be countersigned by an Engineer not below the rank of an Executive Engineer of State Central P.W.D.

Grant released by UGC in different instalments	Sanction Letters No. date	State Govt. Univ. Management share against the final approved cost	Total grant actually released by State Govt. Univ. Management	Total expenditure incurred. (Rs. in lakhs) (write also in words)
(Rs. in lakhs)		(Rs. in lakhs)	(Rs. in lakhs)	
1.				
2.				
3.				
Total				
Rs.				
Rs.				
Rs.				
Rs.				
Rs.				
Rs.				
Rs.				
Rs.	(In words)			

Name & Signature of the Architect (if relevant)

Designation and signature of Engineer-in-Charge (not below the rank of Executive Engineer in CPWD State Govt.)

UNIVERSITY GRANTS COMMISSION
(Applicable for all schemes/programmes of UGC)
PROFORMA FOR SUBMITTING UTILISATION CERTIFICATE IN RESPECT OF
BUILDINGS UNDER CONSTRUCTION BUT NOT COMPLETE

It is certified that _____ (specify the name of the building) which was approved by the University Grants Commission, vide UGC letter No. F. _____ dated _____ is under construction and not complete. The progress of expenditure on the above mentioned building and other financial details as on _____ are given below :

Original estimated cost as approved by UGC	UGC Letter No. and date	Revised estimated cost as approved by UGC (if any)	UGC Letter No. & date	Share of UGC against the approved cost	Total grant released by UGC so far	Sanction Letters No. and date	State Govt./Univ./management share against approved cost	Grant actually released by the State Govt./Univ./management	Total expenditure incurred as on _____ Rs. _____ (Rupees _____)
(Rs. in lakhs)		(Rs. in lakhs)			(Rs. in lakhs)				(Rs. in lakhs)

This certificate is based on audited/unaudited statement of expenditure.

Signature and designation
of competent authority.

Signature and designation of the Engineer
Incharge of the work (not below the rank
of Executive Engineer in CPWD, State Govt.)

Full Name:

Designation:

(Resolution No. _____ dated _____ of
University, or of Executive Body authorising the signatory to
furnish utilisation certificate).

Scheme of Courses in Emerging Areas

UNIVERSITY GRANTS COMMISSION

NEW DELHI

1993

Scheme of Courses in Emerging Areas

1. Objective

The objective of this scheme is to modernise courses by helping Universities and Colleges to start courses in areas of emerging importance/relevance. These courses are intended to prepare specialised manpower in such areas of specialisation.

The list of courses being assisted by the UGC under this scheme is given below: These courses fall in two main categories (i) where it is a full master level course and (ii) where it is a special paper at master's level.

Master's Level Courses

1. Master of Business Administration
2. Master of Computer Application
3. M.Sc. in Electronics
4. M.Sc. in Bio-technology
5. M.A./M.Sc. in Futurology
6. M.Sc. in Environmental Sciences
7. M.A./Postgraduate Diploma in Functional Hindi
8. M.A./M.Sc. in Communication (Separate M.A./M.Sc. in Audio-visual Production/Graphics/Cameraman/Editing/Journalism/Printing Technology/Book Publication)

Special Paper at Master's level

1. Atmospheric Science
2. Remote Sensing
3. Computer applications in Physics/Chemistry/Mathematics/ Statistics/Economics/Commerce/Bio-Sciences/Library (Information Science)
4. Environmental Studies as applicable in Chemistry/Bio-Sciences/Geo-Sciences/Economics/Commerce/History/Sociology.

Bechelor's Level Courses

3 year degree course in Physical Education B.P.Ed.

2. Operational Features

These courses are sanctioned on a selective basis. The proposals of the Universities are considered by the Expert Committees in the UGC. The Expert Committees try to ensure that the sanctioned courses are fairly distributed across the country and that the university seeking a particular course is suitable in terms of availability of infrastructure and standards of education for such advanced courses. Preference is given to those proposals which do not seek assistance for construction

of buildings.

The courses related to Electronic media are considered only in the university having EHRC/AVRC so as to avoid unnecessary expenditure. Courses in Journalism and Publishing are supported in places which are the centres for Newspapers/Magazines/Publishing.

In the special areas where AICTE approval is needed in terms of AICTE Act, the UGC initially receives the proposal and the short-listed proposals are sent to the AICTE. After the AICTE recommendations, decision is taken by the UGC for starting the relevant course. Therefore, the universities may note that even after the AICTE recommendations, they should await UGC sanction which alone entitle them to the UGC assistance.

A course outline for all these courses has been developed by the UGC through the Committees of Experts as in the Annexures Ia to Ij and the university wishing to avail of UGC assistance for such courses has to develop the course based on UGC course outline. After the UGC sanction for the course, assistance is released by the UGC only after the university adopts the course through its Academic Council and furnishes copies of that course to the UGC.

3. Inputs for the Course

The inputs available for starting the courses under this scheme are enumerated in the Annexure II. However, it may be noted that in many of these courses, heavy reliance has to be placed on external faculty/professionals so as to ensure that the students acquire both the knowledge of theory and upto date knowledge of the profession which they should expect to encounter after completing the course. Therefore, the faculty strength sanctioned for such courses is deliberately on the lesser side. The faculty positions sanctioned for these courses must be filled up by scholars having specialised qualification in the concerned subject. Where such persons are not available, and exception has to be made, specific prior concurrence of the UGC should be obtained and then only UGC grant for the salary of such persons will be available.

Most of these courses are application oriented. Therefore, attachment on project basis for 3 months on full time basis and 6 months on part time basis is necessary with a professional organisation in the field in all these courses.

UGC assistance for these courses is available for 5 years after the first UGC sanction for the course. The positions sanctioned under the course are required to be taken over by the concerned State Govt. at the end of the first 5 years, a lumpsum grant for equipment, books, furniture etc. is available from the UGC for next 5 years on matching basis (based on income generated by the department) and this is indicated in Annexure II as part of the inputs. After 10 years, the courses are expected to be looked after by the university out of the departmental assistance given to the university as a whole by the UGC. However, UGC assistance can not be used at any stage for creating any clerical or group D post, whether regular or contingency/daily wage basis.

Since all these courses have strong employment linkage, a condition of UGC assistance is that each student should be required to pay a fee of at least Rs. 250 per month. The teachers and the department is expected to get consultancy/professional work from outside agencies, including sponsored research. In such cases the teacher concerned should be enabled to retain an adequate part of the consultancy fee/income and simultaneously the department should have the entitlement to receive 25% to 35% of the consultancy fee/income. Such departmental income should be used to meet the needs of equipment, consumables, books/journals, furniture etc. in the department.

4. Disbursement of UGC grant

The grants are disbursed by the UGC for all these courses to the university or college concerned. For availability of grant for buildings, the requirements as specified for the building construction under the developmental assistance are applicable. For other items, assistance should be claimed by the university on the basis of the inputs specified in this scheme by accounting for the earlier grant received for the purpose. Generally, assistance claimed should be limited only to one request in an year.

5. Review & Monitoring

The UGC subjects these courses to a review through an Expert Committee once in a plan period. On the basis of such review, the effectiveness of the course is assessed and where warranted sanctions are cancelled.

Annexure-Ia
Broad Outline of the Curriculum for Two Years M.Sc. Electronics

M.Sc. (Previous)

- Paper I:** Quantum Mechanics, Mathematical and Computational Methods of Electronics
Paper II: Electromagnetic Fields and Plasma Electronics and Physics of Electronics Materials
Paper III: Semi-conductor Science and Technology Solid State Devices
Paper IV: Electronic Circuits
Practicals: Lab. 1 : Semi-conductor Material and Devices
Lab. 2 : Analog and Digital Circuits

M.Sc. (Final)

- Paper I:** Quantum Electronics and Opto-electronics
Paper II: Integrated Circuits and Their Technology
Paper III: Microwave Devices, Transmission and Measurements
Paper IV: Communication Electronics
Practicals: Lab. 1 : Quantum and Opto-electronics and Communication
Lab 2 : Microwave Electronics
-

Annexure-Ib
M.Tech. in Biotechnology

Core Subjects (3 Credits)

1. Biological aspects of Biotechnology
2. Technological aspects of Biotechnology
3. Separation technology and downstream processing
4. Bioprocess equipment Design

Elective Subjects (2 Credits)

1. Microbiology and Bioprocesses
2. Mathematics applied to Biological systems
3. Applied Thermodynamics and reaction engineering
4. Cell Biology and Biochemistry
5. Process equipment facilities
6. Principles of Chemical Engineering
7. Bioprocess Instrumentation and control
8. Enzyme Engineering
9. Process Bioreactors
10. Permanent DDNA technology
11. Immunotechnology
12. Transport process
13. Environmental Biotechnology
14. Plant Biotechnology and Agricultural Productivity
15. Molecular Biology

Laboratory Subjects

1. Techniques in Biochemistry, Microbiology and Immunology
2. Electronic Instrumentation and Computer Programming
3. Bioprocess
4. General Engineering and strain development

Apart from the theory & laboratory subjects the students are involved in research programme in the third semester.

Annexure-I c
M.B.A. Full-Time

The Master of Business Administration (Full-Time) Course shall be in two parts viz. Part-I and Part-II.

Part-I

The Schedule of Part-I examination shall be composed of two semesters viz. Part-I Group-A I Semester and Part-I Group B II Semester.

The schedule of papers prescribed for Part-I M.B.A. examination shall be as follows:-

Part-I Group-A I Semester

- Paper 101 - Management concepts and Organisational Behaviour
- Paper 102 - Quantitative Methods-I
- Paper 103 - Managerial Economics
- Paper 104 - Financial and Management Accounting
- Paper 105 - Marketing Management
- Paper 106 - Human Resource Management

Part-I Group-B II Semester

- Paper 201 - Organisation Development
- Paper 202 - Quantitative Methods-II
- Paper 203 - Economic Environment of Business
- Paper 204 - Financial Management
- Paper 205(a)- Production and Materials Management
- Paper 206(a)- Business Law (1/2 Paper of two hours duration)
- Paper 206(b)- Management Information System & Computer
(1/2 Paper of two hours duration)

Part-II

Admission to Part-II M.B.A (Full-Time) Course shall be open to those who have cleared successfully at least nine papers out of the papers offered for the M.B.A. (Full-Time) First year Course comprising of I and II Semesters taken together. However, he/she would have to clear the remaining papers while studying in M.B.A. (Full-Time) Part-II-II Year.

Part-II M.B.A. (Full-Time) Course would be composed of two semesters viz. Part-II Group A I Semester and Part-II Group-B II Semester.

A schedule of papers prescribed for M.B.A. (Full-Time) Part-II-II Year examination shall be as follows:-

Part-II Group-A I Semester

The M.B.A. (Full-Time) Part-II Group-A I Semester, in addition to one compulsory paper, shall include the papers in specialisation areas offered during these semesters from which a student shall have to choose five subjects but not less than three papers in his/her area of specialisation.

Compulsory Paper

Paper 301 - Government and Business

Specialisation Areas

Area-I Behavioural Science

Paper 311 - Leadership and Inter-Personal Dynamics

Paper 312 - Industrial Psychology

Paper 313 - Action Research and Organisation

Paper 314 - Ergonomics

Area-II Personnel Management

Paper 321 - Advanced Personnel Management

Paper 322 - Industrial Relations and Labour Economics

Paper 323 - Labour Legislation in India

Paper 324 - Wage & Salary Administration

Paper 325 - Comparative Industrial Relations

Area-III Financial Management

Paper 331 - Financial Decision Analysis

Paper 332 - Investment Management

Paper 333 - Cost Analysis and Control

Paper 334 - Management of Financial Institutions

Paper 335 - Hospital Accounting

Paper 336 - Bank Management

Paper 337 - International Financial Management

Area-IV Marketing Management

Paper 341 - Consumer Behaviour

Paper 342 - Advertising Management

Paper 343 - Marketing Research

Paper 344 - International Marketing

Paper 345 - Sales Force Management

Paper 346 - Retailing

Paper 347 - Industrial Marketing

Area-V Production and Operation Management

Paper 351 - Production Planning and Control

Paper 352 - Systems Simulation

Paper 353 - Industrial Engineering

Paper 354 - Materials and Maintenance Management

Paper 355 - Operations Research

Paper 356 - Transportation Models

Paper 357 - Econometric approach to Decision Making

Area-VI Public Systems Management & Entrepreneurial Development

Paper 361 - Entrepreneurial Development

Paper 362 - New Enterprise Management

Paper 363 - Small Business Management

Paper 364 - Marketing & Export promotion of Small Business

Paper 365 - Management of Rural Resources

Paper 366 - Institutional Management

Paper 367 - Public Systems Management

Part-II Group-B II Semester

The schedule of papers prescribed in Part-II Group-B Semester shall be as follows:-

Paper 401 - Business Policy

Paper 402 - Public Enterprise Management

Paper 403 - Project Study

English shall be the medium of instructions and examination. The system of evaluation shall be as follows:-

(i) Each paper will carry 100 marks of which 30 marks shall be reserved for internal assessment based on class room participation, seminar, terms papers, tests, viva-voce, practical.

Annexure-I d
M.Sc. Semester-II (15-16 Weeks)

- II.5 Elective II:3 (3-0-0)
- II.5.1 Energy, Ecology and Environment
- II.5.2 Economics and Planning of Energy Systems
- II. 5.3 Urban and Regional Transportation Systems
- II.5.4 Science Dynamics
- II.5.5 Alternative Futures
- II.5.6 Technology Alternatives for Rural Development
- II.5.7 Planning and Management of Human Resources
- Minor Project II: 2 credits (0-0-4)

Total: 17 credits
(19 hrs)

M.Phil Semester-II

- II.1 : 3 credits (3-0-0)
- II.2 or II.3 : 3 credits (3-0-0)
- II.4 or II.5 : 3 credits (3-0-0)
- Major Project/Dissertation in Futures Studies Pt.I:8 credits (0-0-8)

Total : 17 credits
(19 hrs)

M. Sc. Semester II (15-16 Weeks)

- II.1 Science, Technology, Society and Futures: 3 credits (2-1-0)
 - II.2 Operations Research and Decision Theory: 3 credits (3-0-0)
 - II.3 Modelling and Simulation: 3 credits (3-0-0)
 - II.4 Elective I:3 credits (3-0-0)
 - II.4.1 Large Scale Systems
 - II.4.2 Economic Growth-Models and Strategies
 - II.4.3 Management Information Systems
 - II.4.4 Computer Aided Design
 - II.4.5 System Design and Analysis
 - II.4.6 System Dynamics Modelling and Industrial Applications
 - II.4.7 Intelligent and knowledge Based systems
-

Annexure-I e
Future Science

M.A./M.Sc. (Future Studies) : 3-Semester Programmes: 50 Credits

M.Phil(Future Studies) : 2-Semester Summer Programme: 42 Credits

Semester I (15-16 Weeks) (common for M.Sc./M.Phil)

- I.1 Introduction to Futures Studies: Concepts, Techniques, Research methods and Application :
3 Credits (3-0-0)
- I.2 Systems Analysis and Methodology: 3 Credits (3-0-0)
- I.3 Data Processing and Computation: 3 Credits (3-0-0)
- I.4 Technological Forecasting and Technological Assessment 3 Credits (3-0-0)
- I.5 Elective: 3 Credits (3-0-0)
 - I.5.1 Study of Indian Future-Rural Development
 - I.5.2 Urban Society-Future Trends
 - I.5.3 Population Growth: Future Scenario
 - I.5.4 Industrial Futures
 - I.5.5 Social Futures
 - I.5.6 Econometrics and Economic Forecasting
 - I.5.7 Social Research Methods
- I.6 Minor Project 1/2 credits (0-0-4)

Total: 17 credits
(19 hrs)

Annexure-I f
Environmental Studies in Technology

The suggested topics are:

1. **General Courses**
 - (a) Fluid Mechanics.
 - (b) Mechanical Engineering.
 - (c) Electrical Engineering.
 - (d) Surveying and Drafting.
 2. **Physico-Chemical Aspects**
 - (a) Applied Chemistry.
 - (b) Chemical Technology.
 - (c) Chemical Measurements.
 - (d) Physico-Chemical Processes.
 3. **Biological Aspects**
 - (a) Concepts of basic biology.
 - (b) Biological Processes.
 - (c) Ecology.
 4. **Treatment Systems for Water & Wastewater**
 - (a) Water Treatment.
 - (i) Waste Water Treatment.
 5. **Environmental Pollution & Control**
 - (a) Air Pollution.
 - (b) Noise Pollution.
 - (c) Water Pollution.
 - (d) Land Pollution.
 6. **Applied Statistics & Computer Application**
 - (a) Basic Statistical Methods.
 - (b) Computer Application.
-

Annexure-I g
Atmospheric Science

Academic Programmes and Examination

Semester	course	Name of the per Week	Lectures Marks	Course Marks	Sess. Exam. Marks	Written Marks
I	Bridge Course	4	100	40	60	
	Observational Techniques and Data Processing	4	100	40	60	
	Fundamentals of Dynamic Meteorology	4	100	40	60	
	Physical Meteorology	4	100	40	60	
	Lab Course-I		100	40	60	
	Total Marks		<u>500</u>			
II	Fluid Mechanics	4	100	40	60	
	General Circulation & the Climate	4	100	40	60	
	Advanced Dynamic Meteorology	4	100	40	60	
	Optional Course	4	100	40	60	
	Lab Course-II		100	40	60	
	Total Marks		<u>500</u>			
III	Intership	Summer Programme	100	40	60	
	Project & Dissertation	Full Semester	400			
	Total Marks		<u>500</u>			

* **Optional Course:**
Any one out of the list

1. Air Pollution & Atmospheric Chemistry
2. Hydrometeorology.
3. Numerical Weather Prediction.
4. Non-Conventional Source of Energy.
5. Satellite Meteorology etc.

* Addition-I optional courses may be introduced as required in course of time.

Annexure-I h
Functional Hindi

1. Translation

- a. Introduction to Translation Studies
- b. Theory of Translation
- c. Translation and Text Linguistics
- d. Practical work.

2. Journalism

First Year

- Paper-I History of Hindi Journalism
- Paper-II Principles of Journalism and Press Laws.
- Paper-III Reporting and Writing
- Paper-IV Advertising
- Paper-V Practical

Second Year

- Paper-I Editing and Page Making
 - Paper-II Theories and Principles of Mass Communication
 - Paper-III Electronic Journalism
 - Paper-IV Public Relations
 - Paper-V Practicals.
-

Annexure-I I
**Course Curriculum for One Full Paper on *Remote Sensing* at Post Graduate
 Level For Scientific Stream
 (For All Relevant Subjects)**

1.0 Course Structure

<i>Paper</i>	<i>No.</i>	<i>Hours</i>
Theory	One	45
Practical	One	45
Tutoritals+Practical)		

2.0 Course Syllabus

Theory paper will consist of two parts.

2.1 Part I

Part-I of full paper on Remote Sensing will be exactly same as that of Mode-I part paper on Introduction to remote sensing.

2.2 Part II

Application of Remote Sensing in the relevant subject consists of 20 lectures of one hour duration for the following disciplines.

1. Agriculture and Soil Science
2. Geosciences
3. Physics, Oceanography, Marine Biology, Zoology, Fishery Science, Meteorology etc.
4. Botany, Ecology, Forestry.

2.2.1 Agriculture and Soil Sciences

(a) Agriculture

- Crop Inventory: Crop Type classification, area estimates and yield forecasting
- Response of different crops.
- Crop Condition : Spectral response of crop assessment Stress, Crop diseases, Insect
- Spectral damage and crop growth/vigour.
- Crop and water Management and Monitoring.
- Coarse spatial resolution data uses in district level statistical information extraction.
- Integrated crop-Weather-Soil-Technology Modeling.
- Irrigation monitoring and resevoir management.

(b) Soil Sciences

- Spectral responses of different soils. Soil Survey and Mapping
- Soil Conservation and Watershed Management.
 - Watershed Analysis, Priority Area Delineation. Identification and mapping of degraded lands and salt affected soils, eroded/non-eroded lands.

- Landuse/Landcover Mapping and Planning
- Geomorphology in Soil Survey and Mapping

2.2.2 Geosciences

Principles of Geologic and Geomorphic Interpretation of Aerial and Satellite Remote Sensing Data. Recognition of Terrain elements

Landforms, drainage, vegetation cover etc.

- Basic principles of Geological Mapping
 - Identification and Mapping of rock types
 - Structural mapping
- Basic principles of Geological Mapping
 - Identification and Mapping of Landforms -aeolian, arid, fluvial, glacial, volcanic, karst, and marine landforms.
 - Drainage pattern analysis.
- Application of Remote Sensing in Mineral/Oil exploration
- Application of Remote Sensing in Geohydrological Mapping and Groundwater Targeting.
- Thermal and Microwave Sensing for Geological applications.
- Application of Remote Sensing in Engineering Geology.
- Application of Remote Sensing in Environmental Geology.
- Role of high spectral resolution. mid and thermal IR in rock discrimination.
- Role of Laser Techniques in geological studies.
- Monitoring of ground water recharge through use of meteorological satellites for rainfall estimation and conventional hydro data.

2.2.3 Physics, Oceanography, Marine Biology, Zoology, Fishery Science and Meteorology

- Rainfall Estimation Techniques, Cyclone Analysis Techniques & Synoptic Weather Analysis using Visible, Near Infra Red, Middle Infra Red and Thermal Infra Red data sets analog as well as digital mode.
- Spectral response of Sea Water-Optical properties of sea water constituents, scattering and absorption, radiative transfers.
- Oceanographic Satellites and Sensors.
- Oceanographic Applications of Satellite Remote Sensing
 - Sea Truth data collection
 - Ocean Colour Sensors in Visible Wavelengths
 - Sea Surface Temperature from infrared Scanning Radiometers.
 - Passive Microwave Radiometers
 - Satellite Altimetry of Sea Surface Topography
 - Microwave Sensing-Synthetic Aperture Radar.
 - Microwave Scatterometers.
 - Marine pollution
- Absorption bands Remote Sensing for the estimation of humidity and temperature profiles using IR as well as Microwave Techniques.
- Total Ozone. Vertical Ozone profile Measurement and Earth Radiation Budget Measurement Techniques.
- Satellite based Solar Environment Monitoring Systems.
- Search and Rescue System. Data Collection Platform techniques in Oceanography.

2.2.4 Botany, Ecology and Forestry

(a) Ecology

- Spectral Response of Vegetation and Vegetation Mapping.
- Structural and Functional Analysis of Vegetation.
- Ecosystem Analysis.
- Environmental Impact analysis and Monitoring.
- Quantification possibilities from future remote sensing platforms data sets.
- Ecosystems modeling and decision convergence techniques.

- Ecological Survey and Mapping
- Geosphere-Biosphere-Hydrosphere-Atmosphere integration concepts and associated quantification aspects.

(b) Forestry

- Survey and Mapping of Forest Cover
- Spectral Response of Vegetation and Vegetation Mapping
- Forest Change Detection. Forest Damage Assessment and Forest Monitoring.
- Land Evaluation for Forestry
- Forest Sampling Techniques and Forest Inventory

3.0 Course Duration

Lectures	=5 hours per week
Practicals	=5 hours per week
Total	=10 hours per week

Course duration for 45 hours of lectures and 45 hours of practical will be 9 weeks.

4.0 Course Schedule

4.1 Lecture Schedule

Part I

Part-I of this paper is exactly the same as Mode-I part paper on "Introduction to Remote Sensing".

Part II

2.2.1 Agriculture and Soil Science

(a) Agriculture

Lecture No.	Duration Hrs.	Title
26	2	Principles of Air Photo Interpretation and Remote Sensing in Crop Identification. Discrimination and mapping Spectral responses of different crops.
27	2	Crop Inventory-Crop Type identification and classification, area estimation.
28	2	Crop yield forecasting/crop acreage estimation
29	2	Crop condition and damage assessment: Crop Stress. Crop diseases. Insect Damage.
30	2	Crop Monitoring for recording dynamic characteristics.
31	2	Principles of Remote Sensing in Soil Survey, mapping and conservation.
32	2	Principles of Remote Sensing in Water Management, Drought and Drought Monitoring. Flood Mapping.
33	2	Principles of Remote Sensing in Landuse Mapping and Planning.
34	2	Coarse spatial resolution data use in district level statistical information extraction
35	2	Integrated Crop-Weather-Soil Technology Modeling.

(b) Soil Science

26	4	Principles of airphoto-interpretation and Remote Sensing in Soil Survey, Mapping and Classification. Spectral Response of different soils.
27	2	Principles of airphotos/satellites Remote Sensing in Landuse Mapping and Planning.
28	5	Principles of Remote Sensing in Soil Conservation and Watershed Management. Watershed analysis. Priority area delineation.

29	4	Identification and Mapping of degraded lands and salt affected soils. Principles of Airphoto Interpretation and Remote Sensing in Geomorphology for Soil Survey and Mapping.
30	5	Principles of Remote Sensing and Photo Interpretation in Crop Identification. Acreage. Crop Condition Assessment and Monitoring.

2.2.2 Geosciences

26	3	Principles of air photo interpretation and remote sensing in geology- detection, deduction and inference. Interpretation elements. Identification and mapping of rock types and structures.
27	4	Geomorphic analysis of air photo and RS images-Mapping of landforms. Drainage Pattern Analysis.
28	3	Role of high spectral resolution. IR and microwave sensing in rock and mineral discrimination. Laser techniques.
29	3	Remote Sensing and air photo applications in mineral and oil exploration.
30	3	Remote sensing and air photo application in ground water studies.
31	2	Remote Sensing and air photo application in engineering and environmental geology.
32	2	Role of Remote Sensing in Geographic Information System (GIS) applications to resources management and monitoring the geoenvironment.

2.2.3 Physics, Meteorology, Oceanography, Marine Sciences. Fisheries Sciences

Lecture No.	Duration Hrs.	Title
26	1	Oceanography from Space: History, Satellites and Sensors.
27	1	Fundamentals of Remote Sensing in Oceanography. Principles of Remote Sensing of Sea.
28	2	Principles of Image Processing in Oceanography- Enhancements. Sensor Calibration, Atmospheric Correction. Registration and Seasat.
29	1	Optical properties of Sea Water, scattering and absorption and radiative transfer.
30	1	Ocean colour sensors, Interpretation of Ocean colour. Light scattering at Sea Surface. Calibration and application of Ocean Colour Scanners.
31	2	Sea Surface Temperature (SST) from Infrared Scanning Radiometers. Physics of Infrared Radiation. Thermal Structure in Oceans. Atmospheric Corrections and Calibration Techniques.
32	2	Potential Uses of SST data from Satellite Climatology. Global Changes in SST. Weather Prediction and Pollution Studies.
33	1	Physical Principles of Passive Microwave Radiometry. Microwave Radiometer.
34	1	Satellite Altimetry of Sea Surface Topography
35	1	Active Microwave Sensing of Sea Surface Roughness Radar Reflection from Sea Surface. Backscatter Synthetic Aperture Radar (SAR). SAR Geometry. SAR Processing etc.
36	2	Absorption bands of Remote Sensing for the estimation of humidity and temperature profiles using IR as well as Microwave Techniques
37	1	Total Ozone. Vertical Ozone profile Measurement and Earth Radiation Budget Measurement Techniques.
38	1	Studies of Satellite based Coastal Zone Environments.
39	1	Search and Rescue System. Data Collection Platform techniques in

40	1	Oceanography. Brief introduction to <i>Rainfall Estimation Techniques</i> . Cyclone Analysis Techniques and Synoptic Weather Analysis using Visible, Near IR, Mid IR and Thermal IR, data sets in analog as well as digital mode.
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2.2.4 Botany, Ecology and Forestry

Lecture No.	Duration Hrs.	Title
26	2	Principles of Air Photo Interpretation in <i>Forestry and Ecology</i> . Identification. Mapping and Measurement of Vegetation Types.
27	2	Principles of Multispectral Remote Sensing for Vegetation Mapping. Spectral response of Vegetation. Tree Species Identification and Forest Type Stratification.
28	3	Principles of Remote Sensing in structural and functional analysis of vegetation. Ecosystem analysis. Environmental Impact analysis and monitoring. Change detection and <i>Monitoring</i> .
29	3	Land Evaluation for Forestry.
30	1	Applications of Remote Sensing in Rangeland. Grasslands Assessment and Monitoring.
31	1	Principles of Remote Sensing in Landuse/Landcover Mapping.
32	3	Forest Resource Management
33	3	Quantification possibilities from future remote sensing platforms data sets.
34	1	Ecosystems Modeling and decision convergence
35	1	Geosphere-Biosphere-Hydrosphere-Atmosphere integration concepts and associated quantification aspects.

4.2 Practical Schedule

Practical No.	Duration Hrs.	Title
1	20	(Mode-I) Practicals.
21	2	Spectral characteristics of surface (Rocks, Soils, Vegetation and Water)
22	4	Visual Interpretation of Aerial Photos for extraction of thematic information.
23	4	Visual Interpretation of Satellite data for extraction of thematic information.
24	7	Information extraction (Thematic through digital image processing techniques.
25	8	Project work.

Annexure II (Contd.)

Course Curriculum for One Full Paper on "Remote Sensing" at Graduate/post-graduate Level for Engineering Stream (Water Resources and Hydrology)

1.0 Course Structure

Paper	No	Hours	Marks
Theory	One	45	(Flexible)
Practical	One (Tutorials+Practicals)	45	

2.0 Course Syllabus

Theory paper will consist of two parts

2.1 Part I

- The part I of the paper is exactly the same as that of mode-I part paper on "Introduction to Remote Sensing".

2.2 Part II

- Application of Remote Sensing in Water Resources and Hydrology.
- Principles of Remote Sensing in Hydrology. Hydrologic Elements and Hydrologic conditions.
- Remote Sensing Applications in Surface Water Hydrology. Surface Water Mapping and Inventory. Rainfall-Runoff relations. Hydrographs. Floods and Drought Impact Assessment and Monitoring. Watershed Hydrology. Snow and Glacier Hydrology.
- Water Resources Development and Management. Remote Sensing for multipurpose water resources project-Planning. Investigation. Feasibility and Field Surveys. Watershed characteristics. River Hydraulics. Flood Forecasting. Reservoir Sedimentation. Prediction and Monitoring. Fluvial Geomorphology and Environmental Appraisal.
- Hydrometeorology-Analysis of Weather Systems. Cyclone and Depressions based precipitation (including Storm-Runoff Modelling) estimation using satellite as well as ground based informations would be a prerequisite for remote sensing support to flood forecasting, flood inundation mapping, risk zoning.
- Snow melt initiation and water component computation using satellite thermal IR bands.

3.0 Course Duration

Lectures	= 5 hours per week
Practicals	= 5 hours per week
Total	= 10 hours per week

Course duration will be 9 weeks. 45 hrs. for theory and 45 hrs. for tutorials+practicals

4.0 Course Schedule

Part-II

Lecture No.	Duration Hrs	Title
26	1	Role of Remote Sensing in assessment of Hydrologic Elements and Hydrologic Cycle.
27	2	General Principles of Remote Sensing in Geomorphological Mapping. River Morphology. Slope and Landform analysis.
28	1	General Principles of remote sensing data analysis for evaluation of Hydrologic elements.
29	1	Landuse-Landcover in Hydrology Type of landuse. Visual and digital analysis of aerial and satellite data for landuse/landcover classification.
30	1	Aerial photo and satellite Image interpretation in surface water mapping and Inventory.
31	2	Hydrometeorology-Analysis of Weather Systems, Cyclone and Depression based precipitation (including Storm-Runoff Modelling) estimation using satellite as well as ground based information flood forecasting.
32	2	Remote Sensing applications in floods. inundation mapping, flood plain mapping and flood damage assessment.
33	2	Watershed characterisation. Drained Analysis, Erosion Assessment. Rainfall-Runoff Relationships. Watershed Hydrological Modelling.
34	2	Snow cover mapping and snowmelt-runoff forecasting.
35	2	Snowmelt initiation and water component computation using satellite thermal IR and microwave bands.
36	2	Drought Assessment and Monitoring through Remote Sensing.
37	2	Hydrological models. DTM/DEM.

4.2 Practical Schedule

Lecture No.	Duration Hrs.	Title
1-20		as per mode-I
21	2	Spectral characteristics of surface features (rocks, soils, vegetation and water etc.)
22	1	Visual interpretation of aerial photos in surface water mapping.
23	1	Visual interpretation of satellite data in surface water mapping.
24	2	Study of drainage network and river behaviour using aerial photos and satellite data.
25	2	Visual interpretation of aerial photos and satellite data for landuse/land-cover mapping.
26	2	Flood plain mapping through remote sensing. Flood inundation mapping and damage assessment.
27	2	Snow cover mapping.
28	5	Digital Image Processing techniques as applied to Water Resources and Hydrology.
29	8	Project work.

Annexure-IJ

Outline of the Course in Publishing

This course is designed to provide both knowledge and some basic skills: a knowledge of the background and processes of publishing and skills in editing, production and marketing of books. It should have a fair amount of emphasis on practical work, some research and quite rigorous standards being set. At the end of such a course, the student should be able to go into a job and feel equipped to tackle it.

Secondly, to make this more than just a background course, the student is offered a choice of specialisation after the basics have been learnt. This will allow for particular skills to be developed. The details of this can be worked out.

1. General background to book publishing:

- * From manuscript to books
- * The history of printing and publishing
- * The development of paper
- * The book as a social product, mediated by economics history, politics and its role in the spread of ideas
- * The development and spread of publishing in the world: reasons for the uneven spread of different kinds of publishing.

2. Publishing in India:

- * The place of the book in an oral culture
- * Missionary presses and publishing
- * The Mughal influence on the book
- * Colonial publishing and its ideological base
- * Indigenous publishing and its struggle to survive
- * Indian publishing and its role in the spread of ideas.
- * Contemporary Indian publishing and its specificities: the question of language, the question of developing the reading habit, the role of the government, the imported book versus the 'Indian' book, the question of markets, the future of Indian publishing.

3. Comparative studies of publishing in other countries:

- * United Kingdom
- * United States of America
- * African countries
- * Eastern Europe
- * Neighbouring countries
- * Southeast Asian countries

4. Copyright and its meaning, nationally and internationally

5. How publishing works:

- * Capital requirements and their functioning
- * How publishing houses are organized

- * Different departments and their functioning
- * Contracts, budgets, estimates, profits and losses, subsidies, breakeven point etc.
- * Innovative publishers and strategies for change

6. Specializations in publishing:

- * Educational books for school and college levels
- * General or trade books
- * Academic books
- * Scientific and technical books
- * Reference books
- * Art books
- * Children's books

7. The importance of marketing and distribution

8. The future of the book in the new technological age

Part Two: The Processes Of Publishing (specializations)

Editorial

- * Selection of manuscripts
- * Commissioning and acquisitions
- * Screening unsolicited manuscripts
- * Evaluation and vetting
- * Dealing with external evaluators and experts
- * Developing manuscripts with authors
- * List development
- * The importance of being an editor
- * Interacting with other departments for estimates, production costs and schedules. market possibilities etc.
- * Developing a house style
- * Preparing manuscripts for press
- * Overall editing and copy editing (a detailed study of copy editing methods, symbols, and actual work on manuscripts that need to be edited)
- * Dealing with contracts, royalties, advances and working with authors
- * Proof checking and proof reading symbols etc.
- * Balancing editorial priorities and preferences with market demands and solcability of books.
- * The difference between editing trade books and academic books. fiction editing and general editing.
- * Editing on computers: learning to use publishing software, do layouts on screen, format pages and prepare indexes.

Practical work: Students will be asked to prepare model contracts, work out editorial policy for developing lists for specific kinds of publishing, prepare detailed editorial reports on particular manuscripts. edit and prepare manuscripts for press, both manually and on computers.

Production

- * Different steps-involved in turning manuscripts into books
- * Interaction with other departments
- * Casting off and preparing cost estimates
- * Scheduling
- * Supervision of bought-in services
- * In-house typesetting, use of computers for design etc.
- * Selecting illustrations etc
- * Visualizing and designing of books: selecting the appropriate format. typeface, designing page

layouts, matching pictures with text, working with tables and text

- * Preparing dummies and printing specifications
- * Selecting appropriate printers and printing methods
- * Printing in one colour and several colours
- * Half tone printing and use of screens, new possibilities with computer graphics
- * Paper and paper varieties: texture, opacity, suitability, grammage, grain, availability, shade, durability, costs etc.
- * Different methods of binding
- * Cover design and cover printing

Practical work: Typesetting edited manuscripts, preparing page layouts, working out picture and illustration sizes, examining and judging paper, working out paper costs, and if possible, actually supervising a printing job from beginning to end.

Sales Promotion and Marketing

- * Preparation of publicity material
- * Catalogues and mailings, preparation of mailing lists
- * Participation in book fairs and exhibitions
- * Importance of distribution
- * Traditional and alternative methods of distribution
- * Different methods of distribution
- * Marketing in rural areas
- * Sales representation and promotion
- * Price fixation for different markets
- * Trade discounts and trade policies
- * Warehousing, stock arrangement, stock control for publishers and retailers
- * Mail order selling
- * Imports and exports of different kinds of books
- * Retail selling and its characteristics
- * Wholesalers, distributors and library suppliers
- * Book launches, reviews, publicity, author interviews etc.

Practical work: Preparing a promotional plan for a particular type of book—students may work on a book of their choice, be it fiction, or biography, or a general book, preparing advertisement copy for publication in different places, e.g. taking one book and preparing copy for it to be advertised in a general magazine, a scholarly journal and a book review magazine, working out different ways of checking and controlling stock, building up a mailing list, learning import and export rules and regulations etc.

Accounting, Finance and Administration

- * The economics of publishing
- * Budgeting annually and monthly
- * Balancing expense and income
- * Control of overheads
- * Pricing policies and credit policies
- * Keeping records, dealing with copyright libraries. ISBN offices etc.
- * Preparing royalty statements
- * Setting up your own publishing house: capital requirements, relating size to output, overheads, credit requirements, balance sheets etc.
- * Personnel requirements and policies
- * Employee benefits and allowances
- * Team work and personnel management

Practical work: preparing a plan for setting up a small publishing house, working out capital required, locating possible funding avenues, planning a list and its marketing.

Note: There are many aspects of this course which can be overlapping. As it stands now, students can opt for either editorial or production or sales with, preferably, everyone going in for the accounts and administration paper. This last can also, if felt necessary, be offered as a specialisation.

It is also possible to extrapolate from this to make up short, intensive courses in particular aspects--for example, dealing with contracts and rights, or with proof reading, or copy editing, which can be offered to those already working in publishing, who may need to improve their skills and/or develop new ones.

Throughout the emphasis has to be on as much practical work as possible.

Depending on the duration, the students can also be asked to do group projects such as case studies of particular publishing houses, bookshops, the ISBN system etc.

A detailed reading list can be attached if necessary.

Annexure-II Pattern Of Assistance

The Commission will extend support to the programmes as follows:

M.Sc./ in Electronics & biotechnology

1.	Faculty	
	Professor/Reader	One
	Lecturer	Two

(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)

2.	Building costing upto	Rs. 7,50,000/-
3.	Equipments	Rs. 20,00,000/-
4.	Books & Journal's	
	Non-recurring	Rs. 1,00,000/-
	Recurring	Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

Master of Business Administration

1.	Faculty	
	Professor	One
	Reader	Two
	Lecturer	Three

(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)

2.	Building costing upto	Rs. 24,00,000/-
3.	Equipments	Rs. 8,00,000/-
4.	Books & Journals	
	Non-recurring	Rs. 5,00,000/-
	Recurring	Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

NOTE:

1. Above Courses will be sanctioned only when the University submits course design and it is approved by experts in UGC. Assistance will be released when University has prescribed such course and submitted it to UGC.
2. After five years, a sum of upto Rs. 10.00 lakhs will be provided to run the programme for next five years provided the department has matched it by at least an equal amount through consultancy, professional work or sponsored research.

M.A./M.Sc. in Communication

1.	Faculty Professor/Reader	One
	Lecturer	Two
	(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)	
2.	Building	Rs. 7,50,000/-
3.	Equipments	Rs. 12,00,000/-
4.	Books & Journals	
	Non-recurring	Rs. 1,00,000/-
	Recurring	Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

M.A./M.Sc./M. Tech. in Future Sciences

1.	Faculty Professor/Reader	One
	Lecturer	Two
	(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)	
2.	Building	Rs. 7,50,000/-
3.	Equipments	Rs. 5,00,000/-
4.	Books & Journals	
	Non-recurring	Rs. 1,00,000/-
	Recurring	Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

Postgraduate course in Environmental Sciences

1.	Faculty Professor/Reader	One
	Lecturer	Two
	(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)	
2.	Building	Rs. 7,50,000/-
3.	Equipments	Rs. 7,50,000/-
4.	Books & Journals	
	Non-recurring	Rs. 1,00,000/-
	Recurring	Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

NOTE:

1. Above Courses will be sanctioned only when the University submits course design and it is approved by experts in UGC. Assistance will be released when University has prescribed such course and submitted it to UGC.
2. After five years, a sum of upto Rs. 10.00 lakhs will be provided to run the programme for next five years provided the department has matched it by at least an equal amount through consultancy/professional work or sponsored research.

M.Sc./M.Tech. in Atmospheric Sciences

1.	Faculty Professor/Reader Lecturer Non-teaching Staff	One Two Six
(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)		
2.	Building	Rs. 24,00,000/-
3.	Equipments	Rs. 10,00,000/-
4.	Books & Journals Non-recurring Recurring	Rs. 5,00,000/- Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

M.A. in Functional Hindi

1.	Faculty Professor/Reader Lecturer	One One
(The Institution has to manage other faculty from the existing concerned departments and through visiting faculty who are practising professionals)		
2.	Building	Rs. 7,50,000/-
3.	Equipments	Rs. 1,00,000/-
4.	Books & Journals Non-recurring Recurring	Rs. 5,00,000/- Rs. 50,000/- p.a.
5.	Guest/Visiting Faculty	Rs. 1,00,000/- p.a.
6.	Seminar/Conference/Working Expenses.	Rs. 50,000/- p.a.

Special Paper At Master's Level

1.	REMOTE SENSING Faculty Equipments Books & Journals Non-recurring Recurring Guest/Visiting Faculty Seminar/Conference/Working Expenses.	Rs. 5,00,000/- Rs. 1,00,000/- Rs. 50,000/- p.a. Rs. 1,00,000/- p.a. Rs. 25,000/- p.a.
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NOTE:

1. Above Courses will be sanctioned only when the University submits course design and it is approved by experts in UGC. Assistance will be released when University has prescribed such course and submitted it to UGC.
2. After five years, a sum of upto Rs. 10.00 lakhs will be provided to run the programme for next five years provided the department has matched it by at least an equal amount through consultancy/ professional work or sponsored research.

2 ENVIRONMENTAL STUDIES AS APPLICABLE IN DIFFERENT SUBJECTS

Faculty	One
Equipments	Rs. 3,00,000/-
Books & Journals	
Non-recurring	Rs. 1,00,000/-
Recurring	Rs. 50,000/- p.a.
Guest/ Visiting Faculty/ Seminar/ Conference/ Working Expenses.	Rs. 25,000/- p.a.

**PROGRESS REPORT FOR COURSE _____ FOR THE DEPARTMENT OF _____
OF _____ UNIVERSITY**

(To be furnished in duplicate by the Head of the Department)

Progress Report for the Academic Year _____

1. Date on which course sanctioned by UGC.
2. Date from which the course started.
- 3.

ITEM	UN-UTILISED GRANT AVAILABLE FROM PREVIOUS YEAR	GRANT RECEIVED FROM UGC DURING THE YEAR	EXPENDITURE DURING THE YEAR	UTILISATION CERTIFICATE
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Buildings

Equipment

Books and Journals

Guest Faculty

Seminars/ Conferences/-
Working expenses

4. Sponsored research project/consultancy/outside assignment obtained during the year. (Give name of the job and amount earned)

Place
Date

Signature
Name
Designation
(Head of the Department)

NOTE:

1. Above Courses will be sanctioned only when the University submits course design and it is approved by experts in UGC. Assistance will be released when University has prescribed such course and submitted it to UGC.
2. After five years, a sum of upto Rs. 10.00 lakhs will be provided to run the programme for next five years provided the department has matched it by at least an equal amount through consultancy/ professional work or sponsored research.

**Scheme for Postgraduate Fellowship
for ME/M.Tech. Students**

**UNIVERSITY GRANTS COMMISSION
NEW DELHI
1993**

Scheme for Postgraduate Fellowship for M.E./M.Tech. Students

Objective

To help the graduate student to pursue higher technical education so that highly qualified technical manpower is adequately available in the country, the UGC provides scholarship to students of M.E. and M.Tech. courses in the institutional within its purview.

Eligibility and Rate of Scholarship

All students admitted to M.E. or M.Tech. courses in institutions within the purview of the UGC are eligible to receive the postgraduate scholarship. The institutions have to make the proposal by furnishing details to the UGC and they have to assume responsibility for timely disbursement of the scholarship and to render accounts to the UGC. Thus the individual student has neither to apply to the UGC for scholarship nor does he has to submit account for it to the UGC.

The Scholarship is available for the whole duration of the M.E./M.Tech. course and the eligibility of the students starts from the day they join the course and continues for the standard duration of the course prescribed by the concerned university. However, only those students are eligible for the scholarship who have been admitted on the basis of GATE examination or an open admission test in which students from all parts of the country are eligible to appear on equal footing. It is also a condition that a student would be eligible to continue to receive the scholarship in the next semester only if he has cleared a minimum of 60% marks or an equivalent grade in the previous semester. The rate of scholarship is Rs. 1500 per month. However, no foreign student is eligible for this scholarship.

Procedure for claiming grant from the UGC

As soon as the admissions for the course have been finalised. The institution should furnish the names of the students admitted and a certificate to the effect that the students have been admitted on the basis of GATE or open test conducted on all India basis. If some students have not been admitted in this manner, they should not be included in the list. The institution should annex a second list of the candidates continuing from the previous year with a certificate that-

- (i) Each student has secured more than 60% marks in the previous semester for which a scholarship is claimed. Students who have not secured more than 60% marks should be specifically mentioned and for them the amount should not be claimed.

- (ii) The institution should attach the statement of expenditure of the previous scholarship grant from the UGC and utilisation certificate for it in the form prescribed for utilisation certificate in other schemes.

On the basis of above details, the UGC issues sanction for scholarship amount for the coming year.

**PROGRESS REPORT FOR COURSE _____ FOR THE DEPARTMENT OF _____
OF _____ UNIVERSITY**

(To be furnished in duplicate by the Head of the Department)

Progress Report for the Academic Year _____

1. Date on which course sanctioned by UGC.
2. Date from which the course started.
- 3.

ITEM	UN-UTILISED GRANT AVAILABLE FROM PREVIOUS YEAR	GRANT RECEIVED FROM UGC DURING THE YEAR	EXPENDITURE DURING THE YEAR	UTILISATION CERTIFICATE
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Buildings

Equipment

Books and Journals

Guest Faculty

Seminars/Conferences/-

Working expenses

4. Sponsored research project/consultancy/ outside assignment obtained during the year. (Give name of the job and amount earned)

Place
Date

Signature
Name
Designation
(Head of the Department)

SCHEME FOR PROVIDING COMPUTER CENTRE IN UNIVERSITIES

UNIVERSITY GRANTS COMMISSION

NEW DELHI

1993

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New Delhi-110016

DOC, No

Date

D-8706

17-9-95

SCHEME FOR PROVIDING COMPUTER CENTRE IN UNIVERSITIES

The UGC has been assisting the universities for setting up of computer centre since 1970s for use in research and in work relating to examinations and administration in the university. For improving the functional efficiency and keeping in view the development in computer hardware and the possibility of using computer centre for consultancy and contractual jobs which can provide a welcome addition to the income of the university simultaneously with assuring availability of adequate funds for proper upkeep of the computation facility, the UGC has revised this scheme. The revised scheme is as enumerated here.

Functions of Computer Centre:

The computer centre set up with UGC assistance is expected to perform the following functions:

- (i) Design software for administrative/financial/examinative needs of the university and to provide computation facility for these purposes in the computer centre and develop networking with other university computer centres for exchange, expertise and software.
- (ii) Assist researchers in designing software for analysing their research data and to make available computer centre facility for their research work.
- (iii) To provide facility of the computer centre for MCA/MSc. (Computer Science) course in the university.
- (iv) To organise and conduct computer awareness/literacy courses atleast twice an year for students/teachers/university employees.
- (v) To undertake consultancy/contractual work relating to software design and/or computation for outside agencies on payment basis independently or jointly with some software professionals and public/private sector organisation in accordance with the Rules/ Statutes/ Ordinances of the university.

Eligibility for UGC Assistance:

Normally only universities including deemed to be universities are eligible for assistance under this scheme for setting up a computer centre. However, as an exception, this facility can also be considered by the UGC for the highly developed and distinguished Postgraduate Colleges.

UGC Assistance:

The UGC assists the identified university for setting up a computer centre on the basis of an assessment of the need of the university in reference to the functions enumerated for the computer centre in this scheme by an Expert Committee in the UGC. Based on the assessment made by the Expert Committee, the UGC assistance can be either for Level I or for Level II as mentioned below:

Level I

- (i) Mini computer system and work stations (one or more).
- (ii) 16 MB RAM.
- (iii) 1 GB disk space.
- (iv) Minimum 16 terminals.
- (v) Cartridge tape drive.
- (vi) Line Printer and Dot Matrix printers.
- (vii) Net working where justified.
- (viii) Multi-user O/S, DBMS/RDBMS.
- (ix) Relevant software and standard compilers.

The ceiling on the cost of site preparation and the hardware would be Rs. 50 lakhs.

Level II

- (i) Large computer system and work stations (one or more).
- (ii) 64 MB RAM.
- (iii) 4 GB disk space.
- (iv) Minimum 48 terminals.
- (v) Streamer tape drive/Cartridge tape drive.
- (vi) Line printers and Dot Matrix printers.
- (vii) Net working and graphic facilities.
- (viii) Multi-user O/S, RDBMS.
- (ix) Relevant software and standard compilers.

The UGC assistance for site preparation and for the hardware would be generally more than Rs. 50 lakhs and the ceiling in each case would be determined by the UGC on the basis of the expert advice.

Staff for the Computer Centre

Level I:

	Post	No. of positions	Level of posts	Essential qualifications
1.	Head of Computer	1	Reader/Professor	As prescribed for Reader/Professor with Master's/Ph. D. in Computer Science.
2.	System Analyst	1 per shift (Plus one of MCA is subsequently approved)	Lecturer	Master's degree in Computer Science and as prescribed by the university.
3.	Technical Assistant	1 per shift	Technical Assistant in Univ.	B.Sc. with atleast diploma in Computer Applications.
4.	Stenographer	1		As prescribed in the university but with knowledge of word processing.
5.	Students (Assistants)	2 (part-time)	Rs. 1200/-p.m basis for two years work)	Only on tenure for a person.

Level II:

1.	Director Computer Centre	1	Professor	Minimum as prescribed for Professor with Master's degree/Ph.D. in Computer Science.
2.	Senior System Analyst.	1	Reader	Minimum as prescribed for Reader with Master's degree/Ph.D. in computer science.
3.	System Analyst	1 per (Plus one if MCA is subsequently approved)	Lecturer	As prescribed for Level I.
4.	Technical Assistants	2 (plus 1 for each additional shift	Technical Assistant	B.Sc. with diploma in Computer Applications.
5.	Stenographers	2		As prescribed in the university with knowledge of word processing.
6.	Students (Assistants)	4	Rs. 1200/-p.m.	On tenure basis for a maximum of two years for a person.

Recurring Assistance:

Recurring assistance is provided by the UGC as below:

- (i) Salary of posts is provided as per actuals for a period of five years beginning from the year in which the system has been installed or from the year in which first post has been filled up whichever is later.
- (ii) Maintenance of the computer system is provided at the rate at which maintenance contract has been given by the university subject to a maximum of 12% of the hardware cost. Maintenance in the first year is provided free by the supplier. Therefore, UGC assistance is provided from the second year after installation of the system, for a period of four years.
- (iii) Rs. 1 lakh per year for consumables software and books for a period of five years.

UGC assistance does not cover assistance for water/electricity charges or for annual repair of the building Air conditioning equipment.

After this period the computer Centre is expected to meet at least its maintenance out of income from consultancy/contractual assignments.

Procedure for Sanction:

A university/college has to assess its requirement of computation facility in terms of functions mentioned in this scheme and make an application to the UGC for assistance for setting up a computer centre. The application should give the justification for the computer centre in the university, the building/faculty available and the hardware needed under the scheme. It should also give the work available for the computer centre and the work envisaged to develop during the next 5 years. The applications of the university are examined by a Committee of experts in the UGC which invites the university representative for the meeting. The Expert Committee assesses the needs of the university and determines its requirement for the computer centre. Frequently the Expert Committee modifies the hardware requirement and requires the university representative to submit modified proposal on that basis.

Release of Funds

After the approval from the UGC, the university is required to create posts and initiate selection process. Simultaneously, it has to initiate the purchase procedure. After the posts are created and order for hardware is placed, the university has to seek release of funds by furnishing proof of both these actions. The UGC releases 90% of the sanctioned amount on proof of placement of order (and creation of posts) and the remaining 10% after report is received from the university of the installation of the computer system and report of satisfactory functioning of the system. Approval of the UGC for the computer centre is valid for 18 months after the date of issue of approval. If the order for computer system has not been placed and the posts have not been created within this period, the approval lapses and the university desiring to

set up the computer centre has to obtain approval for the computer centre afresh from the UGC.

The recurring grant is sanctioned by the UGC in advance for the first year after receiving the report of installation of the computer. For subsequent years, recurring grant is released only on receipt of item-wise expenditure for the previous UGC recurring grant and utilisation certificate for that. Recurring grant for any year has to be claimed at most in the succeeding year because after that it lapses and cannot be revived.

Consultancy/contractual work:

Every university having computer centre with UGC assistance is expected to make vigorous effort for securing consultancy/contractual work both software design and for computation on payment basis within the Statutes/Ordinances/Rules specified by the university for this purpose. At least 50% of the income from this, after deducting the payments due to the individuals who worked for the project/work, has to remain available to the computer centre for meeting unforeseen expenditure and to maintain the computer centre in good condition. While furnishing accounts and utilisation certificates to the UGC, accounts for income obtained from consultancy/contractual work have also to be submitted.

MCA/M.Sc. (Computer Science Courses):

MCA is Sanctioned only to those Universities/Colleges which have been sanctioned Computer centre. In the universities having computer centres or in universities for which computer centre is being considered by the UGC, the requirement of the students of MCA/M.Sc. Computer Science should be projected by the university while seeking assistance for computer centre. The Expert Committee takes this requirement into consideration while recommending appropriate configuration and level of hardware for the computer centre. For the university having computer centre, the UGC will augment the computer centre facilities with more terminals, if there is a requirement, whenever MCA/M.Sc. (Computer Science) is approved to the University.

Validity of earlier sanctions:

The UGC has earlier sanctioned posts for the computer centre differently. These sanctions will remain valid but the posts sanctioned earlier which have not been filled up so far are not allowed to be filled up unless they are covered by the posts permitted under this revised scheme. Similarly the posts which are vacated henceforth out of the earlier sanctioned posts, are not allowed to be filled up unless they are covered by the posts sanctioned in this revised scheme.

Replacement/upgradation of computer hardware:

Because of the limited life of a computer system and the rate of obsolescence, UGC considers replacement of the hardware given for a computer centre after 7-8 years. At that time it also considers upgradation of the hardware/level of the computer

centre if it is justified by the needs of the university as judged in the light of the use the university has put the computer system to. While assessing the use of the existing facility, the UGC requires the following:

- (i) The number of hours per working day (use of computer) in last 3 years as reflected by the log book.
- (ii) The number of research papers published in referred journals for which computer centre facility has been used. Annual data for last 3 years has to be furnished alongwith the name of the researcher, title of the research paper, the name of the journal and the number/year of the journal in which each paper has been published.
- (iii) The names of computer science courses and students/faculty/employees covered by computer literacy/awareness course annually for last 3 years.
- (iv) The number and description and consultancy/contractual assignments obtained and money value of each assignment along with the amount which was made available by the university for retention in the computer centre for its use annually in last three years.

The replacement/upgradation of the hardware for the centre would depend on the assessment of the performance of the centre as reflected by the above mentioned details. If necessary, UGC deputed experts to visit the computer centre to complete the assessment. This assessment also constitutes the evaluation of the work of the centre by the UGC.

Computer Literacy Courses (Awareness):

Every computer centre is expected to conduct atleast 3 computer literacy (awareness) course of two weeks or more duration every year for students/teachers/university employees. Each of these persons should be charged a fee of not less than Rs. 100/- per person per course. This fee should be used for providing material to the learners and for maintenance of the computer centre.

Computer Man Power Development Courses

The UGC was earlier assisting for Diploma in computer Application also. UGC does not assist for DCA now because such courses are not expected to be provided by non-university and non-Government institutions under the policy decided in consultation with the Department of Electronics. Assistance to DCA courses for which UGC has given sanction will continue for the stipulated period of 5 years. For the B.Tech. and M.Tech. courses the approval has to be obtained first from the AICTE. Therefore, the university/college should make an application to the AICTE through the UGC and based on AICTE recommendation, the UGC sanctions assistance in individual cases.

For MCA the UGC sanctions 3 teaching positions, one of Professor, one of Reader and one of Lecturer. Assistance for these posts is available for 5 years from the date of filling up of the first post on the condition that the State Government

undertakes to maintain them after the UGC assistance ceases after 5 years. Since the sanction and hardware facility for MCA has been integrated now with that for computer centre, the UGC does not provide working expenses for the students for MCA course and similarly technical staff is not provided separately for the MCA Scholarship for the students of MCA has also been stopped.

The UGC has framed a model course for MCA. When a university/college applies for MCA course, the application is examined by an Expert Committee for availability of existing computer centre, of the faculty and in terms of the standard of the course developed by the university. It is necessary that the course developed by the university is such that the standard of MCA would be good. While sanctioning MCA, the UGC insists that the admission is made through an open admission test in which outside students should be considered on equal footing with the local candidates.

The computer Science department should make maximum use of the Guest Faculty for teaching MCA students. UGC will sanction upto a maximum of Rs. one lakh p.a. for hiring guest faculty for teaching MCA students.

**PROGRESS REPORT FOR COMPUTER CENTRE OF _____
UNIVERSITY**

(To be furnished in duplicate by the Head of Computer Centre)

1. (a) Posts Sanctioned by U.G.C.
 - (b) Number
 - (c) Filled up (give date)
 - (d) Whether incumbent has professional qualification at PG/Ph.D. in Computer Science.

2. Computer
 - (a) Date of UGC Sanction
 - (b) Date of Installation

3. Use of Computer Centre:
 - (a) For MCA (Number of students)
 - (b) Literacy Classes (Give number of trade)
 - (c) University jobs done (give jobs done)
 - (d) Outside assignments done (name the assignment and amount charged)
 - (e) Consultancy (name the job and amount) done.

Place
Date

Signature
Name
Designation

**Scheme for Computer Application Papers of
Postgraduate Level in Certain Disciplines:
UGC Assistance Therefor**

**UNIVERSITY GRANTS COMMISSION
NEW DELHI
1993**

Scheme for Computer Application Papers at Postgraduate Level in Certain disciplines -UGC assistance therefor

The computers have ushered in a revolution in informatics. Computers have made possible many processes and analysis which were earlier unmanageable due to their complexity or size. Because of their capabilities, the computers have been finding applications in more and more diverse areas. The UGC, therefore, has been assisting the universities to set up central computation facility in the form of large capacity computers wherever the requirement of research and teaching justifies it. Sizeable computational facility is also being assisted by the UGC under SAP/COSIST programmes. The colleges are being assisted by the UGC in the form of 2 PCs and some software for their use and in institutional management and for increasing the awareness about use of computers among teachers and students.

Subsequently, the UGC has considered the desirability of assisting the universities and colleges for starting an optional paper at postgraduate level in subjects in which computer applications have become prominent. Initially the UGC has identified Mathematics, Physics, Chemistry, Geo-Sciences, Economics, Statistics, Library Science and Commerce for being covered under this scheme.

Eligibility of Institutions

All Universities and Postgraduate colleges which have 3 or more of these subjects and which have an enrolment of atleast 35 (Part-I and II) at postgraduate level under each of these subjects are eligible to receive UGC assistance under this scheme.

Features of the Scheme

The UGC will assist the identified university/college for setting up a computer room with 10 PCs. The university/college is required to prescribe one paper in the identified subject (2 papers are possible in Statistics and Commerce). Since students of one subject will require access to PCs for about 2-3 hours in a day, it is a condition of the scheme that the concerned university/college should prescribe paper for computer applications in atleast 3 subjects out of the 8 covered under this scheme before it can be assisted by the UGC. A suggested outline of the paper in each of the subjects covered under the scheme is annexed. The university would be required to develop its own syllabus for the paper on this basis before it submits application for assistance to the UGC. An Expert Committee in UGC will assess the course developed by the university to ensure that it is not below an acceptable standard. The university would also be expected to require atleast an equal time for onhand work with PCs compared to the lecture/teaching.

The UGC will not sanction any post under this scheme. The concerned departments are expected to manage teaching by using the existing faculty and supplementing it by guest faculty. The concerned departments between themselves

will have to identify a nodal department. It can be the department in which the computer room is located. From among the concerned departments an employee suitable for working as Technical Assistant would be identified for looking after the computer room and the equipment there. If necessary the university/college can provide some honorarium on monthly basis to such a person. While making the proposal the university/college will have to identify a room in reasonable condition and which is not dusty for being used as computer room. It should be able to conveniently accommodate 10 PCs.

For the proposals accepted by the UGC, the assistance will be for the following items and the amounts mentioned against each item:-

1. Non-Recurring

(a) Hardware

- (i) 10 PCs (Minimum 286-AT)
- (ii) 10 Monitors (Soft-white) with CGA/MGA Cards
- (iii) 10 Key Boards (101 keys or above)
- (iv) 3 Printers (132 column)
- (v) 3 Printers sharers
- (vi) Constant Voltage transformer (3 KVA)
- (vii) Furniture (Computer tables, Chairs, Almira etc.)

Rs. 7.00 lakhs

(b) Room Preparation

- (i) Distemper Painting, Linoleum flooring, Rubber lining in windows etc.

Rs. 0.25 lakhs

(c) Software

- (i) Language compilers
- (ii) Operating system DOS
- (iii) Relevant manuals
- (vi) Need based software packages

Rs. 0.50 lakhs

(d.) Consumables

- (i) Floppies
- (ii) Computer papers
- (iii) Printer Ribbons

Rs. 0.25 lakhs

II. *Recurring*

- (i) Honorarium to Technical Asstt.
- (ii) Honorarium to Guest Faculty
- (iii) Consumables
- (iv) Books
- (v) Software
- (vi) Maintenance (contractual)

Rs. 1.25 lakhs
per year

In order to ensure involvement of the students and teachers and to also ensure availability of some funds for unforeseen expenditure it is a condition of the scheme that every student will have to be charged a fee for the use of this facility which will not be less than Rs. 50/- per student per month.

It will be expected that every university/college assisted under this programme would also use the computer facility for its internal management and for conducting atleast one course for computer awareness and literacy in an year for students/teachers/employees who are not covered by the special papers at PG level. A fee not less than Rs. 100/- per participant would be charged for the awareness course.

Procedure for UGC assistance

The university/college which desires to avail of UGC assistance under this scheme should:-

- (1) Identify 3 departments out of the subjects covered under this scheme and develop detailed course for the special paper at PG level for each of the 3 subjects keeping in mind the model course outline appended with this scheme.
- (2) Identify the nodal department and identify the room for locating the PCs.
- (3) Prescribe fee for the participating students.

Along with these particulars and enrolment figure in the preceding year at PG level in the subjects proposed by the university/college, it should apply to the UGC for assistance. The proposal would be examined in the UGC with the help of an Expert Committee and on acceptance of the proposal, non-recurring assistance would be sanctioned. This assistance will be released in one instalment on receiving copy of the course prescribed by the university and approved by the UGC and on receiving copy of the order placed for the hardware/software by the university/college.

For recurring assistance no break up is prescribed for individual items and the

university/college can utilise more or less money for any individual item but the UGC assistance would be limited to Rs. 1.25 lakhs per year subject to the item-wise accounts and utilization certificate being furnished by the nodal department/university/college. The accounts furnished to the UGC would also involve the amount collected as fee and details of their expenditure. Recurring assistance would not be provided for one year after the installation because the suppliers maintain the hardware for one year under normal terms of supply. For the second year the recurring assistance would be provided as an advance and for subsequent years recurring grant would be released on receipt of accounts and utilization certificate for the earlier grant. The recurring grant will however, lapse for any particular year if it is not claimed atleast in the subsequent year.

The UGC will assist university/college under this scheme for 5 years for recurring assistance. After this period the university/college would be expected to take over the maintenance/continuation cost, if necessary, by obtaining such additional assistance from its funding agency or preferably, by earning enough money by taking on paid assignments for outside user agencies.

Evaluation

At the end of the 8th plan period the UGC will evaluate the implementation, its quality and coverage through an Expert Committee and university/college would be apprised of the findings of the evaluation. It would be expected to take such remedial action as may be suggested by the Committee.

PHYSICS

(Page 1)

Computer Applications in Physics

- Introduction to Computer hardware and software; information storage in Computer memory; stored program concept; storage media; Computer operating system; DOS and its use.
- Problem solving on Computers-algorithms and flowcharts; high level programming language for scientific computing; FORTRAN 77: data types; expressions and statements; input/output commands; conditional and iterative constructs; character data management; array manipulations; subprograms; files and data handling facilities for sequential and direct access devices.
- Essential of parallel computation; FORTRAN 8 X and its features for parallel programming.
- Use of scientific packages to solve problems in physics popular electronic spreadsheets to model simply physical systems and there graphical presentations; elements of presentation graphical.
- Programming examples to study the following numerical methods to investigate problems in physics;
 - # Interpolation and extrapolation; least square fitting;
 - # Solution of simultaneous equation; polynomial equation; polynomial equation fitting;
 - # Matrix manipulations; matrix inversion; eigenvalue computations;
 - # Numerical integration and differentiation;
 - # Ordinary boundary-value problems two dimensional problems, accumulation of erros;
 - # Monte carlo method and its applications; evaluation of two and three-dimensional integrals.

Suggested Books

1. G.I. Duchi: Spreadsheet Applications for Scientists and Engineers, (Add. Wesley, 1988)
 2. P.S. Grover: Programming and Computing with FORTRAN 77/90 (Allied Publishers, 1992)
 3. V. Rajaram : Elements of Parallel Processing (Prentice - Hall, 1990)
 4. R.N. Reddy & C.A. Ziegler: FORTRAN 77, (Jalco Book, 1989)
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CHEMISTRY

(Page 1)

Computer Application in Chemistry

I. Introduction to computers:

Hardware components: CPU, Computer memory, I/O devices; information storage; software components: computer programs; stored program concept; operating system; DOS and its use. Algorithm, program flowcharts and pseudo-code.

II Basic

Variables (integer, single precision, double precision and string). Arithmetic statements and built in functions. Logical statements and comparisons. string functions. User defined functions. Control statement (GOTO, IF....THEN, IF... THEN... ELSE, FOR.....NEXT, GOSUB, RETURN). Input/Output statements (CEREEN, CLS, COLOR, LOCATE, PRINT) Graphic commands. PEEK, POKE and DEF SEG Computer graphics.

III. FORTRAN 77

Character set. Identifiers. Data types. Arithmetic expressions and operations. Library functions. Input/Output functions. Formatted input and output statements. Control structures (sequence, relational operations and expressions, simple and nested blocks) Loop control (DO WHILE AND REPEAT UNTIL, DO.... CONTINUE and nested loops). Function and subroutine subprograms. Shared variables and constants. One dimensional and multidimensional arrays character data manipulation. File and data manipulation (OPEN, CLOSE, INQUIRE, REWIND, BACKSPACE, ENDFILE)

Programming examples to handle the following numerical methods in chemistry should be done: such as least squared fit, solution of simultaneous equation, polynomial equation, polynomial equation fitting, matrix inversion and diagonalisation and numerical differentiation and integration. Splines and data smoothing. Elements of parallel processing and its use in chemistry.

IV. Use of software packages in chemistry

(a) Spreadsheet Applications

Least squares fit, kinetics,, potentiometric titrations and end point location. Fitting curves and plotting functions.

(b) Data-base applications in chemistry.

CHEMISTRY

(Page 2)

Illustrative Projects

- 1) Molecular formula from elemental analysis.
 - 2) Simulation of organic qualitative analysis.
 - 3) Simulation of inorganic qualitative analysis.
 - 4) Molecular formula from high resolution mass spectroscopy.
 - 5) pH of a weak acid bases titration (with graphics).
 - 6) Potentiometric end point determination (with graphics).
 - 7) Simulation of the sequence of a copolymer.
 - 8) The persistence length of a ploymer.
 - 9) Monte Carlo simulation of kinetics.
 - 10) Iteration methods.
 - 11) Computation of s from C_p .
 - 12) Simulaion of Maxwell-Boltzmann distribution.
 - 13) Theoretical NMR pattem.
 - 14) Generation of an ODE system from a reaction mechanism.
 - 15) Runga-Kutta method for solving ODDE system for reaction.
 - 16) Data smoothing and splines
 - 17) Parallel and perspective projection for 3D molecules and computer graphics.
 - 18) Contour plots.
 - 19) Use of electronic spread sheet for problems solving in chemistry (a least squares fit graphics, kinetics, potentiometric titration).
 - 20) Use of standard application packages like molecular modaling, NMR, IR spectrometric simulation.
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CHEMISTRY

(Page 3)

Suggested Books

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1. R.N. Reddy & C.A. Ziegler: *FORTRAN 77 (JAICO BOOK, 1989)*.
 2. P.C. JURIS, T.L. Isenhour & C.L. Wilkens: *BASIC Programming for Chemists (J.Wiley, 1987)*.
 3. K. Ebert, H. Ederer, T.L. Isenhour : *Computer Applications in Chemistry*.
 4. G.I.Duchi : *Spreadsheet Applications for Scientists & Engineers (Addison-Wesley, 1988)*.
 5. G Beech: *FORTRAN IV in Chemistry. An introduction to computer-assisted methods (John Wiley & Sons)*.
 6. P.S. Grover: *Programming & Computing with FORTRAN 77/90. (Allied Publisher, 1992)*.
 7. V. Rajaram: *Elements of Parallel Processing (Printice-Hall, 1990)*.
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MATHEMATICS

(Page 1)

Computing Techniques in Mathematics

A. Computer Programming

The flowchart concepts, FORTRAN programming, Integer and real operations, control and iterative statements; array operations; logic and complex operations subroutines and function subprograms.

B. Use of a popular electronic spreadsheet; mathematical modelling with spreadsheet-solving mathematics problems such as square-root, binomial probability; use of scientific and mathematical software packages.

C. Numerical Analysis and Computational Techniques:

Number representation and Arithmetics.

Non-Linear equations, Bisection, Fixed point iteration, Newton-Raphson method, roots of polynomical equations.

Interpolation, Finite Difference Calculus, Polynomial interpolation, Inverse interpolation, Spline interpolation.

Least square approximation, Fourier approximation.

Gaussian elimination, iterative methods, relaxation method.

Numerical differentiation and integration.

Ordinary differential equations, Taylor's series method, Euler's method, Runga Kutta methods

Predictor corrector methods, stability issues; modelling & simulations applications.

Suggested Books

1. D.E. Agranbriht: Mathematical Application of Electronic Spreadsheets (McGraw-Hill, 1985)
 2. P.S. Grover: Programming and Computing with FORTRAN 77/90 (Alleid Publishers, 1992)
 3. E.V. Krishnamurthy and S.K. Sen: Computer-Based Numerical Algorithms (East-West Press, 1984)
 4. G.B. Davis and T.R. Hoffmann: FORTRAN 77 (Mc Graw-Hill, 1986)
 5. S. Jacobi & J. Kowalik: Mathematical modelling with Computers (Prentice Hall, 1985)
 6. D. Burghes & M. Borrie: Modelling with Differential Equations (John Wiley, 1986)
 7. A. Ralston & P. Rabinowitz: Numerical Analysis (McGraw-Hill, 1986)
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GEOSCIENCES

(Page 1)

Computing Techniques in Geosciences

(a) Computer Programming

Computer System; hardware components-CPU, Memory, i/o devices; information storage media; software: Computer programmes; operating system concepts; DOS and its use.

Problem solving and computer programming languages useful for scientific computing; FORTRAN 77: various data types ; expression and statements; input/output commands; conditional and iterative constants; array manipulation; sub programs; data sharing among subprograms/programs; file manipulation. Programming examples to handle problems of numerical and statistical type.

(b) Numerical Methods

Matrix operations; inversion; eigen, symmetric and real symmetric matrices; interpolation and extrapolation; smoothing of curves: best square fit.

(c) Statistical techniques

Probability, discrete and continuous distributions, estimation of parameters; hypothesis testing; ANOVA; linear/polynomial regression and correlation; elements of multivariate analysis; principal components/factors; clustering; multiple/partial correlations; MANOVA; discriminant factors.

Suggested Books

1. D.H. Sanders: Computer Today (McGraw Hill, Intl. Ed. 1988).
 2. V. Rajaraman: Computer Oriented Numerical Methods (PHI, 1984).
 3. A.A. Afifi: Statistical Analysis: A Computer-oriented Approach. (Academic Press, 1985).
 4. P.S. Grover: Programming and Computing with FORTRAN 77 and 90 (Allied Publishers, 1992).
 5. R.N. Reddy and C.A. Ziegler: FORTRAN 77 (Jaico Book, 1989).
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ECONOMICS

(Page 1)

Computer Applications in Economics

1. Introduction to Computers and MS-DOS Operation System:
Computer System: Hardware, Data storage media, I/O Devices, RAM, ROM, MS-DOS operating System: Files and Directories, Hard Disk Management, Resident and transient Commands. Use of DOS Editor and DOS, DOSHELL.
2. Dbase: Files and Records, String, Numeric and Data type data. String and Numeric functions. Doing repetitive commands using Do-For Loops. Preparing Reports.
Lotus 123: Worksheet Structure, Manipulation of Rows and Columns, Using the Worksheet Menu. Use of Data commands; Making a simple data distribution. Making Graphs: Line, Bar, XY, and Pie charts. Simple Linear Regression.
3. Introduction to Econometric Software and use of available package such as SHAZAM, RATS, GAUSE, or TSP.
Entering data from the terminal, Reading data stored in LOTUS, Free or Fixed Format ASCII. Defining and Modifying the simple range. Introduction to linear Regression: OLS, GLS. Instrument Variables.
4. An application to Economic Models:
 1. The Capital Asset Pricing Model.
 2. Cost, Learning Curves and Scale Economies.
5. Advanced Topics:
 1. Forecasting and Simulation in simple Macro-econometric Models.
 2. The Structure of Algorithms used in least Squares Regressions.
 3. Maximum-Likelihood and Non-Linear Estimation.

References:

1. Robert Cowart Introduction to Dbase IV SYBEY 1990.
 2. Judd Robbins The ABC of 123 Release 3 BPB Publications 1990.
 3. Ernest R Berndt: The Practice of Econometrics: Classic and Contemporary Addison and Welsley Publishing Co. 1990.
 4. R.M. Farebrother: Linear Least Squares Computations Marcel Dekker, 1988.
 5. A.H. Studenmund and H.J. Cassidy Using Econometrics: A Practical Guide Little Brown and Co. 1987.
 6. Ivor Francis Statistical Software (North-Holland.
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STATISTICS

(Page 1)

Paper 1

Computer Concepts and Software Tools

- Introduction to Computer and its components: bits, bytes and words; Computer Memory and its types: data representation and storage; binary codes; binary system and its relationship with boolean algebra; different number systems and arithmetic operations.
- Input/output devices; online and offline data entry; secondary storage media-magnetic tapes, disks and optical disks; character reader.
- Kinds of computers-personal, minis, mainframe and supercomputers; their characteristics and application areas.
- Fields, records and files; file types; data storage and retrieval; interactive and batch processing; time sharing and multiprocessing; concepts of data communication and distributed computing.
- Basic concepts of system software; OS, editor, compiler and interpreter; DOS and its functions; file and disk management facilities.
- Data-base concepts; various data-base models: preparation and use of statistical data-base; analysis and computer solution of some concrete statistical problems.
- Data analysis software packages; spreadsheets; planning and creating spreadsheets; salient features and use of spreadsheets for statistical analysis; presentation graphics.
- Use of commonly available statistical packages, such as SPSS, Minitab, BMDP to solve problems from statistics such as regression analysis, analysis of data on sample survey and design of experiments.

Note: This course is to be supported by Software Lab. Ratio between Lecture and Lab. hours should be around 3:2 for proper implementation of this course.

Suggested Books

1. D.H. Sanders : Computers Today (McGraw-Hill) International Ed. 1988.
 2. P.C. Curtin : Microcomputer and Applications (PHI, 1989).
 3. P.S. Grover : Computer Fundamentals and Problem Solving (Allied Publishers, 1990).
 4. D.M. Kroenke : Database Processing (Galgotia Pubs., 1990).
 5. Manuals of Packages: SPSS; MINITAB; BMDP.
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STATISTICS

(Page 2)

Paper II

Computing Techniques relevant to Statistics

Introduction to Programming Languages ; major high level languages; choosing a programming language for statistical computations; Characteristics of statistical oriented problems; program design; features of good program; documentation.

Programming with FORTRAN 77:

Data Types: expressions and statement; input/output commands; conditional and interactive constructs; array manipulation; subprograms; data sharing among subprograms/programs; file manipulation facilities; FORTRAN 90 and its features for parallel processing.

Numerical computation : Solution of non linear equations by -Newton Raphson, iteration etc., interpolation (Lagrange, Newton etc.), numerical integration (Trapezoidal, One-third, Gauss), matrix inversion, Solution of System of linear equations.

Monte Carlo methods; random number generation; Applications- sampling, parameters estimation, quadratic; variance reduction; system simulation.

(N.B.: Students may be encouraged to complete a mini project based on live statistical data as assigned by the teacher)

Suggested Books

1. Ivor Francis: Statistical Software (North-Holland, 1986)
 2. E.V. Krishnamurthy and S.K. Sen : Computer-based Numerical Algorithms (East-West Press, 1984).
 3. A.A. Afifi : Statistical Analysis : A Computer-oriented Approach Academic Press, 197).
 4. V. Rajaraman : Computer-oriented Numerical Methods (PHI, 1990).
 5. P.S. Grover: Programming and Computing with FORTRAN 77/90 (Allied Publishers, New Delhi, 1992).
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LIBRARY SCIENCE

(Page 1)

Computer Application in Library & Information Services

1. **Introduction to Information Technology:**
Historical development of Computers and their application.
 2. **Computer systems:**
 - Hardware: Configuration of a computer-input, output processing and storage and internal and external devices & media and their inter-relationships (RAM; ROM; DISK, Tape, Cassette, optical disk, CD-ROM etc.)
 - Data input and output devices.
 - Types of Computers-Main frames; Mini and Micro computers; Single user and multi user.
 - Software System Software: operating system; Applications software.
 3. **Data Processing:**
 - Basic processes: Calculating, logical operations-Sorting, storing, merging and Retrieving
 - File Design, Data files, records and fields
 - File organisation; Serial, Sequential, Direct access, Index sequential and Random file organisation; database concepts; organization of data into a database; utility of databases.
 4. **Programming:**
 - Introduction to programming:
System analysis; Flowcharting;
 - Elements of Pascal programming.
 5. **Fundamentals of Telecommunication:**
 - Representation of Information; transmission of signals and Transmission media modes and devices.
 6. **Networks:**
 - Local Area Networks (LAN).
 - Wide Area Networks (WAN).
 - Electronic transmission; Electronic mail, Facsimile Transmission.
 7. **Office automation and electronic publishing**
 - Desk Top Publishing (DTP).
 - Word Processing: WORDSTAR.
 - Spreadsheets: LOTUS 1-2-3.
 - Reprography (Micrographics).
 8. **Discussion and use of library packages such as:**
CDS/ISIS, MINISIS, etc; salient features of existing library databases, such as DIALOG, MEDLARE.
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LIBRARY SCIENCE

(Page 2)

Bibliography on Application of Computers. i.e. Library and information Services

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1. KIMBER (RT), *Automation in libraries*, Ed 2. Oxford; Pergamen Press. 1974.
 2. SALMON (Stephen R). *Library automation systems*. NewYork; Marrel Dekkar 1975.
 3. KUMAR (PSG) *Computerization of Indian libraries*, Delhi; BR Publishing Corporation, 1987.
 4. MAHAPATRA (Piyush Kant) *Computer in library services*. Calcutta; World Press. 1985.
 5. SINGH (SP) *Automation in libraries*, Delbi, Metropolitan, 1975.
 6. SHARMA (CD) and OJHA (DC) Ed. *Advances in library and information science. VI Computer application*, 1988.
 7. LEHMAN (Klans-Dieter) and STROHL-GOEBEL (Hide), Ed. *Application of micro computer in information, documentation and libraries*. Amsterdam; North Holland. 1987.
 8. ROWLEY (JE), *Computers for libraries*. Ed. 2. London; Clive Bingley, 1984.
 9. LOVECY (Ian), *Automating library procedures: a survivor's Landbook*. New Delhi; DK Agencies. 1984.
 10. TEDD (LE). *An introduction to computer based library systems*. Ed. 2. Chic hester, 1984.
 11. Grover, P.S.: *Pascal Programming Fundamentals* (Allied Publisher, 1990).
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COMMERCE

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Paper-1

Computer Applications to Business

Introduction to business Data Processing, Information needs of business enterprises, Types of information, Qualities of good information.

- Introduction to computer and its components; bits, bytes and words; computer memories-RAM, ROM; input/output devices; online and offline data entry; secondary storage media magnetic tapes, disks; character readers; modes of computer usage.
- Software and hardware concepts; computer generations; personal, micro, mini and mainframe system; computer as a tool for data processing; data processing cycle; fields, records and files; data processing techniques; data analysis.
- Basic concept of system software; OS, editor, compiler, interpreter; Currently popular operating systems (such as MS- DOS) and its functions; file and disk management facilities.
- Data concepts and characteristics; database planning and design; data models; DBMS software and its components; use of a popular DBMS package to handle real-life problems, such as in business; presentation graphics and its use.
- Data analysis software packages; spreadsheets, planning and creating spreadsheets; salient features and applications to business problems; spreadsheet as a tool for decision making; modelling with spreadsheets.
- Introduction to text processing, word processing features, DTP operations.

Suggested Books

1. D.H. Sanders: Computer s Today (McGraw-Hill International Ed, 1988).
 2. D.C. Curtin: Microcomputers and Applications (PHI, 1989).
 3. P.S. Grover: Computer Fundamentals and Problem Solving (Allied Publishers, 1992).
 4. J. Kamin: DOS-5 (Galgotia Publication, 1992).
 5. C.Jorgensen : Mastering 1-2-3 (BPB Publications, 1986).
 6. E.C. Oliver and R.J. Chapman : Data Processing.
 7. K.K. Bajaj: Office Automation (Macmillan, India, 1989).
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COMMERCE

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Paper-II

Business Systems Analysis and Design

- Definition of system; need for system analysis; building a computer-based information system various steps involved; system life cycle; gathering information-sources and strategies.
- Data flow diagrams and system description; data analysis, ER diagrams; process description; documentation, project dictionary. documentation, project dictionary
- Designing a new system; analysis techniques; structured systems analysis; HIPO; SSDAM; prototyping.
- Project management; tools for project management; strategic planning; project reviews and walkthroughs.
- Linear programming and its applications to handle business problems; input/output analysis.
- Software options for business enterprises; procurement and development; Implementation and testing of software systems.
- Computer as an aid to decision maker; decision support systems.

Suggested Books

1. I.T. Hawryskiewicz : Systems Analysis and Design (PHI, 1991).
2. H.D. Clifton : Business Data Systems (PHI, 1986).
3. Russel A Stultz: The Illustrated dBase III plus (Galgotia Publicatio)
4. Miriam Lisking Advanced Base III plus : Programming and Technique (McGraw Hill, 1988).
5. Haneisen and Camp: Business System for Micro Computer-Concept, Design and Implementation (PHI, 1991).
6. A.J. James : Analysis and Design of Information Systems (McGraw Hill, 1986).
7. R.J. Thierauf: User-oriented Decision Support Systems (PHI, 1988).

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2. **Guidelines for Fellowships and Schemes of Research Projects.**
3. **Guidelines for Autonomous College, COSIP, COHSSIP and Computers to Colleges.**
4. **Guidelines for Courses in Emerging Areas including Scheme for Computer Centre and Master of Computer Applications Course.**
5. **Guidelines for COSIST, SAP and USIC.**
6. **Guidelines for Imovative Programmes, Value Education, Yoga, Sports Infrastructure and Adventure Sport.**
7. **Scheme for Gandhian/Nehru/Budhist Studies Women's Studies and Area Studies Centres, and Programmes for Adult and Continuing Education.**
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