PLAN AND PROGRAMME

REGIONAL COLLEGES OF EDUCATION

REGIONAL COLLEGES UNIT
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING

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INTRODUCTION

A. THE BACKGROUND

THE Regional Colleges of Education are a part of the programme sponsored by the Central Ministry of Education to improve the quality of secondary education—a programme based on a recognition of the widening variety of needs, abilities and aptitudes which the secondary schools should provide for, as secondary school enrolment increases rapidly, doubling every eight years. The Secondary Education Commission, in 1953, identified the inadequacies of the then existing system of secondary education as follows :

> This (secondary) education was too bookish and mechanical.....and did not cater to the different aptitudes of the pupils or to pupils different aptitudes.....The unilateral scheme of studies which concentrated almost entirely on preparing students for enterance to the University was not calculated to bring out the best either in the teacher or the pupil.....again, a failure to provide diversified courses of study made it difficult for many students to secure suitable employment at the end of the course.[1]

The Commission made recommendations of far reaching importance for the improvement of secondary education which included :

1. the upgrading of high to higher secondary schools ;

2. the establishment of multipurpose schools with a variety of diversified courses to suit the different abilities, interests and aptitudes of an ever increasing student population ;

3. the provision of a core programme which includes social studies, general science and craft education, and

4. the expansion and improvement of facilities for the teaching of science.

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1. *Report of the Secondary Education Commission,* Ministry of Education, Government of India. Publication No. 165, 1953, p. 20.

The quick pace of industrialisation during the last ten years, with the social and economic changes it has set in motion, has brought into greater relief the need for aligning the system of secondary education more closely to the requirements of a rapidly developing economy.

On the recommendation of the Secondary Education Commission, endorsed by the Central Advisory Board of Education in 1954, the Government of India promoted the establishment of multipurpose secondary schools in the country.

The aim of the multipurpose secondary school is to provide diversified programmes to cater to the varying interests, aptitudes, and talents represented in the increasing proportion of the population who are entering the secondary schools, and to link education at the secondary stage to the needs of the country.

By the end of the Second Five Year Plan (1961-62), about one-eighth (over 2,000) of the secondary schools were multipurpose in design. Of this number, only a small fraction offered more than three of the seven diversified courses which had been recommended for these schools.

Although the concept of the multipurpose school was readily accepted and the scheme expanded rapidly, certain difficulties came in the way of the concept being fully realised in the actual organisation and practices of the schools. A study made by the Ministry of Education in 1958, and a subsequent study made by the Ohio State University Team in India in 1959[2], revealed that the development of multipurpose education on proper lines required,

1. a clear understanding and agreement about the purpose and functions of multipurpose schools and the objectives which the practical courses are to serve ;
2. the supply of qualified and trained teachers, especially in the practical courses, and provision for pre-service training ;
3. provision of instructional materials especially text-books and hand-books ;
4. increase in the range of elective courses ;
5. provision of facilities educational and vocational guidance ;
6. training and supply of teachers for industrial crafts.

The growing demand for science education could not be adequately met, partly because of the lack of adequately trained and qualified science teachers and partly because of the lack of knowledge of techniques of teaching general science courses.

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2. *The Status of Agriculture, Commercial and Technical Education in Multipurpose High Schools in India,* The Ohio State University Education Faculty in India, 1959.

The Planning Commission[3], therefore proposed that during the Third Plan attention should be concentrated on consolidation of the multipurpose scheme by strengthening the institutions already established.

The Commission also suggested that an integrated teacher training programme for the multipurpose schools should be undertaken in four regional training colleges which would prepare teachers for the multipurpose schools through in-service and pre-service training programmes both in the practical and in the scientific subjects.

The Regional Colleges Project

The Ministry of Education, Government of India, accordingly decided to establish four Regional Colleges of Education in the country for the training of teachers required for multipurpose and secondary schools. This project was subsequently transferred to the National Council of Educational Research and Training, an autonomous body set up in September, 1961, by the Ministry of Education, Government of India.

Acknowledgements

A team of officers of the Government of India and consultants from the Ohio State University under the United States Agency for International Development in India commenced work on the project in January, 1962. The plan and programme that is detailed in this document is the result of a long series of consultations, discussions and conferences with subject specialists, educators and educational administrators drawn from all parts of the country. A number of special committees and working groups were convened to work out specific parts of the programme. A list of individuals who formed the committees and working groups is given in the Appendix. The names included here however, represent only a partial list of those who have contributed to the making of the programme and to whom recognition is justly due. To all those who gave unstintingly of their time and energy, the project is deeply indebted. Our acknowledgement in gratitude is due to the academic bodies of the Universities to which the Colleges are to be affiliated, for the sympathetic consideration they have accorded to this new programmes and for the helpful suggestions they have given.

B. THE PROGRAMME

The programme of the colleges has grown out of an analysis of the nature and needs of secondary education in India. Certain assumptions about teacher education were formed on the basis of reports and studies and in a series of workshops and seminars.

3. *Third Five-Year Plan*, Planning Commission, Government of India, 1961, p. 587.

Assumptions Underlying the Programme

1. The professional competence required of the teacher is achieved through an organized programme of learning experiences ; it is not merely a by-product of becoming a well educated person.

The preparation of the teacher requires much more than a collection of courses and degrees. It should focus on what teachers do as individuals and as members of the profession, and should be concerned with the development of the teacher's personality.

The first step in planning the programme for the Regional Colleges of Education was, therefore, to identify the various competencies desired of the professional teachers and then to analyze each competency in terms of what the teacher would need to know or be able to do.

2. The education of a teacher based broadly on a foundation of general education should include a thorough mastery of subject matter so as give him an insight into its structure and interrelationships, and professional preparation.

The secondary school teacher needs, on the one hand, the higher education required to provide mastery of the basic skills and concepts which underlie mastery of subject matter, and on the other hand, he needs the preparation which enables him to deal expertly with the problems faced by a secondary school teacher. These problems range from how to evaluate achievement to how to teach advanced subject-matter concepts.

3. General education which contributes to growth as a person, specialization which provides scholarly knowledge of the subjects to be taught, and professional education which leads to understanding and skill in professional performance, must be integrated into a total programme.

Functionally general education, specialization, and professional education are not to be thought of as compartmentalized and isolated fields of study. Each area leads on by natural gradation to others, and what one gets from one area is reinfored by what is derived from others.

For purposes of presentation the programmes in science and technology are arranged under separate sections devoted to general education, subject matter education, and professional education. This is not intended, however, to suggest that sharp distinctions exist between these areas. For example, the basic work in any discipline might appropriately be considered as general education. More important than the framework of presentation, is the requirement that the staff will work as one unit and that ALL staff members in ALL departments will strive to help the prospective teacher in forming an integrated structure of what he learns.

4. The prospective teacher must assume responsibility for his own education in an increasing measure.

The goals of teacher education cannot be achieved unless the learner takes greater responsibility for his own education. Opportunity for independent study must be a built-in part of a teacher education programme, for the spirit of inquiry and investigation depends upon time for reflection and upon a wide range of opportunities for exercising individual initiative.

5. Opportunities to work with adolescent learners must be an integral part of the professional preparation of the secondary school teacher.

The student must spend time with adolescent learners so that he may learn how to help them. Provision must, therefore, be made for the study of children, for observation and study of the teaching process, for living as a part of a school, and for teaching in a classroom.

The Competencies of a Teacher

The general competencies desired of a good teacher are that he be :

1. Educated in the liberal spirit of learning so that he may make his contribution as an individual and a citizen.

2. Have the basic attitudes required in a democratic society.

3. Competent to represent the education profession and his subject-matter field in the school and in the community.

4. Thoroughly grounded in the theory and practice of his subject matter and have knowledge and skills necessary for teaching theory and practice in an integrated manner.

5. Able to contrive and use a variety of effective teaching-learning procedures.

6. Able to develop and use instructional materials including audio-visual aids.

7. Able to select and organize subject-matter for instructional purposes.

8 Able to use a variety of methods to evaluate pupil progress and the effectiveness of his own teaching.

9. Capable of recognizing individual needs of students and adapting teaching-learning situations to individual needs.

10. Able to select and use appropriate equipment and determine supply needs.

11. Able to function effectively in the guidance programme of the school.

12. Capable of organizing, supervising and participating in co-curricular activities.

13. Capable of functioning effectively as a teacher as evidenced by actual classroom performance.

14. Interested in continued growth through participation in professional associations, community activities, inservice education, research and experimentation.

Under favourable conditions, students admitted to the teacher education programme would be selected by criteria which would identify those higher secondary school students who have highest potential for becoming successful teachers. Their total college programme would accordingly be designed to help them prepare for teaching. However, in only two curricula, science and technology, has this approach been possible because of factors that prohibit further expansion. Until such time as four-year programmes can be provided in other fields, the colleges will offer one-year teacher education programmes in all areas including science and technology. These programmes are designed to prepare in the limited time of one academic year, teachers whose previous college education was not directed towards teacher education.

The Colleges of Education have been broadly conceived : thus inservice education programmes for educational workers, research activities, preparation of instructional materials, and other educational services are planned as integral phases of the total programme. Also, the colleges are residential institutions so that attention may be given to all aspects of development of the students-curricular and co-curricular. The emphasis on non-academic activities is designed to promote the student's health, citizenship and creative interests and abilities.

The Objectives of the College

The major objectives of the Regional Colleges of Education are :

1. To develop and provide a programme of teacher education for the multipurpose schools and to prepare teachers of technical subjects, science, crafts, agriculture, commerce, home science and fine arts.

2. To provide inservice courses for the existing teachers of the practical subjects in multipurpose schools.

3. To provide inservice programmes and field services for the teachers, supervisors and administrators concerned with the multipurpose schools in the region in which it is located.

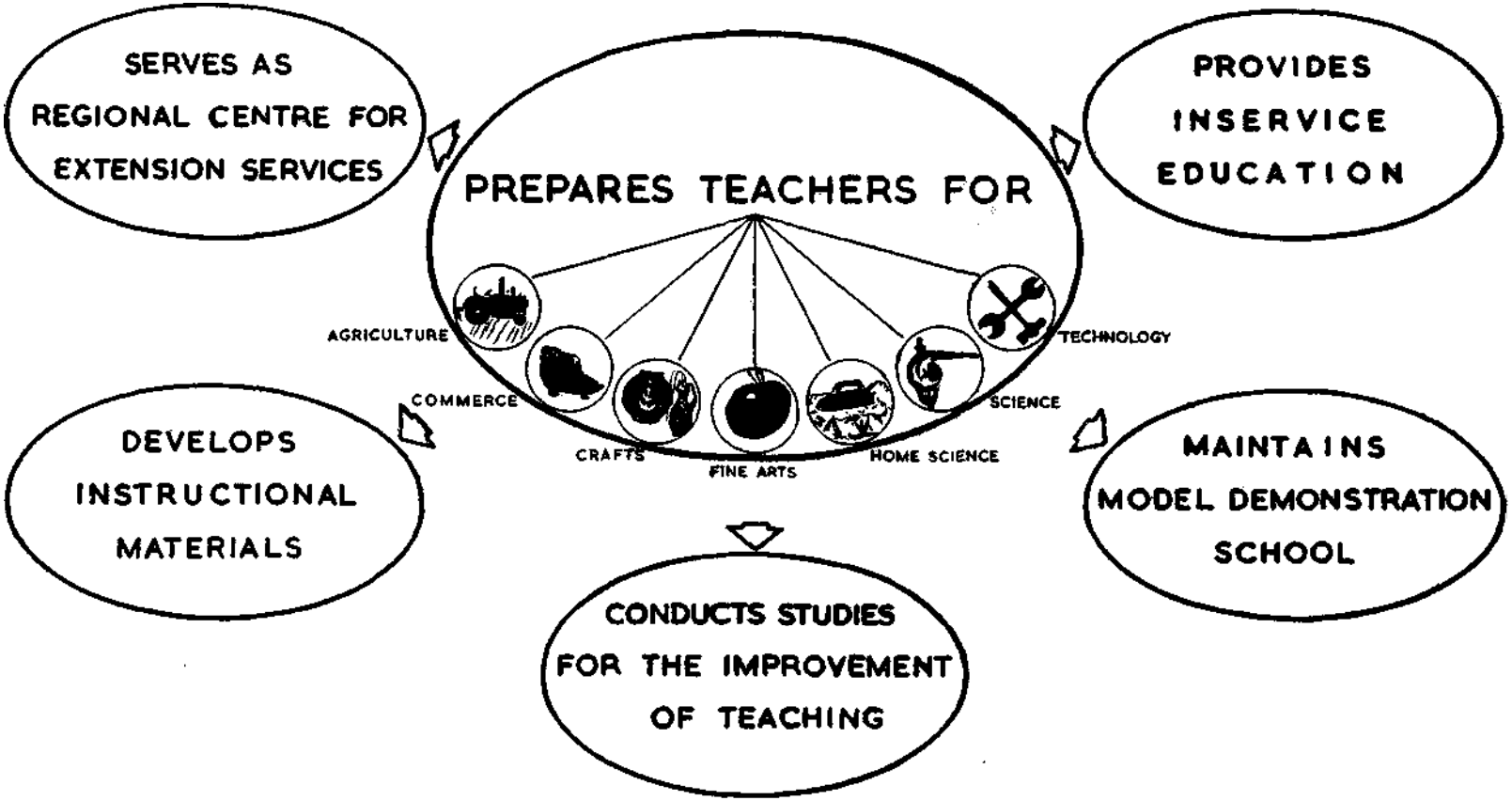
4. To organize and develop a model demonstration multipurpose school.

5. To function as a regional centre for programmes of inservice education and field services for secondary schools in general.

6. To undertake pilot studies and research projects in the methods of teaching, in relation to the multipurpose schools as well as the general secondary school.

7. To evolve and try out improved patterns of teacher education.

REGIONAL COLLEGE OF EDUCATION



8. To prepare and disseminate instructional materials for secondary schools in general and multipurpose schools in particular.

9. To collaborate with other institutions in initiating and promoting improved methods and practices, to function as a clearing house in this regard and generally to provide leadership.

The performance of the colleges in attaining these objectives should be the measure of their success.

C. THE REGIONAL COLLEGES PROJECT

The Regional Colleges of Education are being established by the National Council of Educational Research and Training (NCERT), an autonomous body established in 1961 by the Government of India to develop integrated programmes of educational research, training, and extension work. The members of the Council are :

Union Minister for Education—President *ex-officio*
Educational Adviser to the Government of India—Vice President
Chairman of the University Grants Commission
Vice-Chancellor of Delhi University
One representative of each State Government who shall be the Education Minister of the State or his representative
All members of the Governing Body of the council
Such other persons, not exceeding twelve, as the Government of India may from time to time nominate.

The work of the National Council is carried on by its Governing Body, the membership of which is as follows :

President of the Council—*ex-officio*
Vice President of the Council—*ex-officio*
Not more than three persons appointed by the Ministry of Education
Secretary to the Government of India, Ministry of Finance, Department of Expenditure or his representative
The Director of the Council
Two members of the Board of Educational Studies of the Council
Vice-Chancellor of Delhi University
One person to be nominated by the Vice-Chancellor of Delhi University

Location, Sites and Buildings

The Regional Colleges of Education are located one each in the northern, southern, eastern and western regions of India.

The States were requested to propose sites for the colleges and to make

land available free of cost for the college campus. A Site Selection Committee set up by the Government of India visited the sites and selected the following four locations :

Location	*Region served*	*States and Territories Covered*
Ajmer	Northern Region	Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Delhi and Himachal Pradesh.
Bhubaneshwar	Eastern Region	Assam, Bihar, Orissa, West Bengal, Manipur, Tripura, NEFA and NHTA.
Bhopal	Western Region	Maharashtra, Madhya Pradesh and Gujarat.
Mysore	Southern Region	Andhra Pradesh, Mysore, Madras and Kerala.

Approximately one hundred acres of land have been provided for the campus of each College. The major buildings being constructed include the college building, demonstration multipurpose secondary school, staff quarters, hostels, and some ancillary structures. Approximately 20 to 25 acres have been set aside at each of the three sites for an agricultural farm and for necessary farm buildings. The fourth site at Bhopal, is situated on the top of a rocky hillock overlooking the city. Arrangements for farm land will be made close to the site.

The college building houses the administrative block, library, seminar and lecture rooms, staff rooms, student common rooms, and the departments of technology and crafts, science, agriculture and commerce. The department of home science is being established in the first stage in Ajmer and Mysore colleges ; and of fine arts in Bhopal and Bhubaneswar. At Ajmer and Bhubaneshwar facilities for technology are being provided to house the experimental four-year teacher education programme. Although in the initial stages, a four-year programme in science is being planned at only two colleges, the science laboratory facilities are the same in all four colleges.

A demonstration multipurpose school is located on each college campus. These schools have two basic functions : first, to serve as exemplary institutions to demonstrate a good multipurpose secondary school programme ; secondly, to serve as laboratories for new methods in teaching practice.

Building Specifications and Schedules

Initial planning of the college campus was done by the Regional Colleges Unit of the National Council of Educational Research and Training by roughly delineating the carpet area required by each department of the college, school and hostel and other services.

It was decided to develop independent sets of plans for each of the colleges, rather than to develop a single plan at the centre for all buildings. This was necessary because of the varying nature of the programme in each college and the nature and orientation of the site at each place. The plans were accordingly developed in collaboration with the respective State Architects and State Public Works Departments.

Foreign Collaboration

The project is being assisted by the United States Agency for International Development through a contract with the College of Education, Ohio State University, Columbus (Ohio). The assistance consists of—

1. Technical assistance in the form of educational consultants to work at the Central Unit as well as at the Colleges.
2. Equipment to the value of about Rs. 15 lakhs from the USA.
3. Training at the Ohio State University of 21 participants belonging to the College staff and the Central Unit.

The Science Departments of the Colleges will be receiving technical assistance from UNESCO under the Expanded Technical Assistance Programme.

College Programmes

It is proposed to offer the following programmes at the colleges :

1. Four-year programme for preparing teachers of science.
2. Four-year programme for preparing teachers of technology.
3. One-year teacher education programme in each of the following areas :
   a. Agriculture
   b. Commerce
   c. Fine Arts (Bhopal, and Bhubaneswar only)
   d. Home Science (Ajmer, and Mysore only)
   e. Science
   f. Technology
4. A programme of inservice education.
5. Three types of programmes for craft teachers : a one-year diploma programme, a two-year diploma programme and a two-year degree programme.

The needs of the region will determine the programmes offered at each college. During the first year of operation not all programmes will be offered at all the colleges. Initially, the four-year programme will be started at Ajmer and Bhubaneswar only.

The four-year programmes in science and technology have been formulated to meet the urgent need for teachers in these two areas. These

programmes are experimental in nature. Subject matter, professional education, and general education are integrated throughout the four years. Candidates who have passed the higher secondary school examination or its equivalent, with science, mathematics or technology as subjects of specialisation will be admitted to these programmes.

Four-year programmes in other areas may be started at a future date depending upon the need and the experience with the four-year courses in science and technology.

University Affiliation

Affiliation of each college has been sought with the university serving the area in which the college is located :

College	*University to which Affiliation is sought*
Ajmer	Rajasthan
Bhubaneswar	Utkal
Bhopal	Vikram
Mysore	Mysore

Recognition of the Demonstration School

The Demonstration Multipurpose School attached to each college will be administered by the National Council of Educational Research and Training through the same administrative channels as provided for the colleges. The programmes of the demonstration schools will be recognized by the Central Board of Secondary Education.

Selection and Preparation of Staff

The plan provides for the early selection and preparation of staff for the colleges. The four principals were added to the planning staff during August and September, 1962. The contract with the U.S.A.I.D. provides for the training of 21 participants, 20 from the Colleges and one from the Centre. The twenty staff members will have a seven month study programme at the Ohio State University, where they will study the working of comprehensive high schools and the patterns of preparing teachers of agriculture, commerce, industrial arts, technology and inservice education. A special programme of study and orientation will be held in India for other members of the staff prior to their taking positions in the Colleges.

Staff of the Department of Science will have training facilities under UNESCO programme.

Schedule for Starting Programmes

The schedule for initiating programmes in the colleges is as follows :

1963. August—Starting a limited number of courses at three Colleges.

1964. June—Passing out of the first batch of students of the one-year programmes.

July—Starting all courses at all colleges.

July—Starting certain classes at the demonstration schools on all campuses.

1967. June—Graduation of the first batches of students of four-year degree programmes.

D. ADMINISTRATIVE CONTROL AND ORGANIZATION

1. The four Colleges of Education with attached demonstration multi-purpose schools are maintained and financed from the budget of the National Council of Educational Research and Training.

2. In terms of the Memorandum of the National Council, all executive and administrative responsibility rests with the Governing Body of the Council.

3. The appointments to the staff of the colleges and the schools are made by the appointing authority designated in this behalf by the Governing Body and in accordance with the procedure prescribed for such appointments.

4. Each College has a Management Committee the members of which are appointed in accordance with rules contained in the Memorandum of Association of the National Council.

5. The Management Committee exercises such powers of administration as are delegated or assigned to it by the Governing Body.

Management Committee

(a) The Management Committee will meet at least three times a year and special meetings may be called by the Chairman of the Committee.

(b) The Principal of the Regional College will act as Secretary of the Committee and keep a record of its meetings. The proceedings of the Committee will be placed before the Board of Educational Studies and the Governing Body.

(c) The Committee will provide a liaison between the College, the Departments of Education and the schools in the area served.

(d) The Committee will have the following responsibilities :

(*i*) Review from time to time the college programme or any aspect of it and make recommendations to the Governing Body of NCERT.

(*ii*) Recommend the conditions on which students deputed by the various State departments of education may be enrolled.

(*iii*) Recommend the number, types and duration of inservice courses to be offered by the college.

(*iv*) Indicate the number of seats to be provided for each course, and the distribution of the seats among the States.

(*v*) Prescribe the criteria for selection of students for various courses.

(*vi*) Suggest policies and plans for carrying out student teaching, field experience and cooperation with schools.

(*vii*) Advise on the types of instructional material that the College should prepare.

(*viii*) Serutinize and examine the proposals for inclusion in the budget and the development plan of the College.

(*ix*) Perform such other functions and discharge such responsibilities as may be assigned to it by the Government Body.

The Principal

6. The Principal is responsible for the over-all administration of his College and attached demonstration multipurpose school.

In addition to carrying out the day-to-day administrative duties, the Principal is specifically responsible for :

(a) Preparing the annual report on the operations of the college and submitting the report to the Management Committee and Governing Body of NCERT.

(b) Preparing the annual budget and items of new expenditure for submission to the Management Committee and the Governing Body of NCERT.

(c) Authorising all expenditure from the budgeted funds in accordance with the approved college budget. The budgeted funds are to be placed at the disposal of the Principal by the Governing Body of NCERT and the Principal is empowered to incur expenditure from these funds subject to such limitations as may be prescribed by the Governing Body or the Director of the Council.

(d) Assigning duties to all staff members.

(e) Carrying out correspondence with the University to which the college is affiliated, referring those matters involving major policy decisions to the appropriate higher authorities, and ensuring the compliance with the rules and regulations of the University.

(f) Selecting students admitted to the college with the assistance of a suitably composed selection committee.

(g) Submitting to the Director of NCERT confidential personnel reports on the work and conduct of all staff members appointed by the NCERT.

Financial Administration

7. (a) *Budget*

(*i*) The college budget including that of the attached demonstration multipurpose school will be prepared by the Principal of the College and sent to the Governing Body of NCERT by the due date specified by the Council after scrutiny and with the recommendation of the Management Committee.

(*ii*) The budget will be approved by the Governing Body.

(*iii*) The budgeted funds will be placed at the disposal of the Principal by the Council in the beginning of each financial year.

(*iv*) The Principal will be authorised to approve all expenditures of funds in accordance with the provisions of the budget and subject to prescribed limitations.

(b) *Operation of Accounts*

(*i*) The Principal will open an account in the local State Bank, deposit the funds and operate the accounts.

(*ii*) The Principal may keep Rs. 500/- as imprest money at any time.

(*iii*) The sanction of the Principal will be necessary for any expenditure in the college within the budget.

(*iv*) The account of the college will be maintained by the Accounts Officer in books and each book will be closed and signed every day by the Administrative Officer.

(c) *Audit*

(*i*) The accounts of the College are subject to audit by the auditor of the Council and to the scrutiny and examination of the Chief Accounts Officer of the Council.

(*ii*) The audit objections together with the replies of the Principal will be placed before the Governing Body whose instructions thereon will be obtained and sent to the Principal for compliance.

PART II

ADMINISTRATIVE ORGANISATION AND SERVICES OF THE COLLEGES

THIS section deals with (a) the role of the members of the staff as members of the faculty, as members of the special committees set up for specific purposes, and their internal administrative relationships ; (b) projected enrolment and staff requirement ; (c) college year and time-table ; and (d) special services such as student field experience, guidance and counselling, and production of instructional materials.

A. INTERNAL ADMINISTRATION ORGANISATION OF THE COLLEGE

The Principal will be the chief Executive of the College and of the attached Demonstration School. In the discharge of his duties and responsibilities, he will be assisted by special faculty and student committees. In addition to their teaching responsibilities, the faculty will assist the Principal in the internal administration and organisation of the college.

Special Administrative Functions of the Faculty (see Chart I)

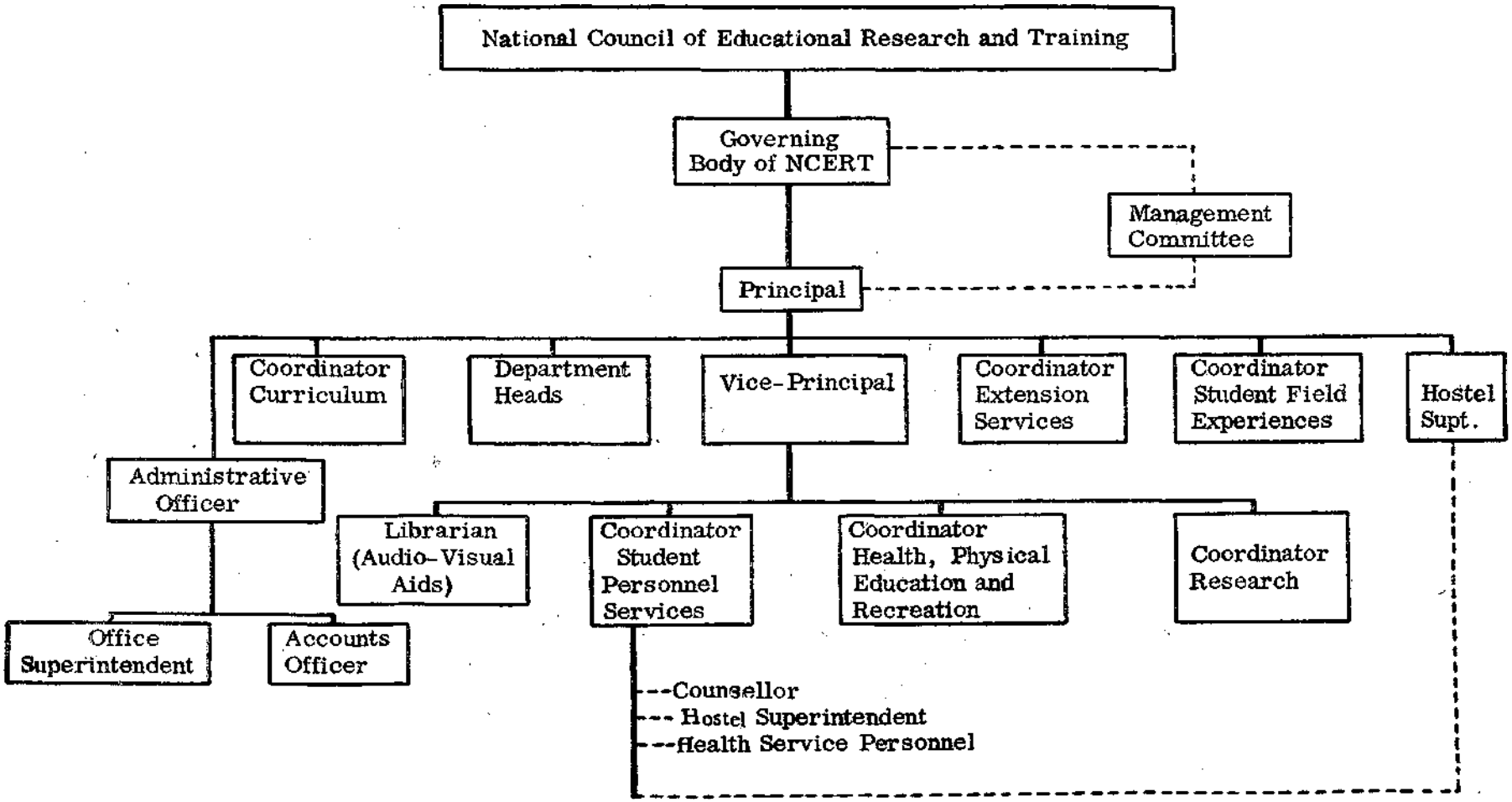
Vice-Principal will hold delegated responsibility in respect of general administration of the college and special services.

Coordinator of Student Personnel Services (Reader in Psychology—part-time), will be responsible for the organisation, coordination and supervision of the guidance programme in the college, hostel and school.

Counsellor (Lecturer in Psychology—part-time), will be responsible for the implementation of the guidance programme including orientation of students, individual counselling, maintenance of record files, and placement programme for students who graduate from the college or who leave the college before completing their course.

CHART 1

INTERNAL ORGANIZATION



Hostel Counsellors (Members of the staff—part-time), will be responsible for assisting in the guidance programme and for providing individual counselling to boarders. In addition, they will look after the health, welfare and discipline of the students and the food services in the hostels.

Coordinator of Student Field Experiences (Reader's rank—part-time) will be in charge of the organisation and administration of the student field experiences programme including :

a. evaluating and selecting schools to serve as practising schools.
b. conducting seminars for teachers of cooperating schools.
c. in consultation with the department concerned, assigning students to appropriate schools and at the appropriate time for observation and field experience.
d. arranging in cooperation with the departmental heads, heads of the cooperating schools and the cooperating teachers for the supervision and evaluation of student teachers.

Coordinator of Extension Services (Reader—part-time), will be responsible for :

(a) organizing, developing and administering the department of extension services in the college. His functions will include :
  (i) planning and coordinating in-service courses in the various subjects in consultation with department heads.
  (ii) assessing the needs for and the planning in-service courses in consultation with State Education Departments and secondary schools in the region.
(b) coordinating the activities of the Extension Services Centres in the region.

Director of Health, Physical Education and Recreation (full-time), will be responsible for physical education, health, and recreational programme of the college.

Coordinator of Curriculum (Reader—part-time), will be responsible for developing and improving courses and instructional materials in consultation with the concerned members of the faculty. This includes :

a. serving as secretary to the Committee on Programme Improvement.
b. serving as a member of the Instructional Materials Coordinating Committee.
c. directing the College Instructional Materials Centre.

Coordinator of Research (Reader—half-time), will be responsible for :

a. channelling and securing the cooperation of members of the college staff in research projects sponsored by NIE and other agencies.

b. channelling and transmitting research needs of the College and Demonstration School to the Central, State, and other organisations which have educational research as a primary objective.

c. encouraging and assisting small research projects undertaken by the College Staff.

OTHERS :

(a) *Department Heads* are responsible for organizing, developing and administering their departments. This includes :

(a) developing and directing the programme and services of the department.

(b) working with the department staff in planning the evaluation and recommending changes, additions, and deletions in the courses of studies.

(c) organizing counselling programmes for students within the department.

(d) determining equipment and library needs and teaching assignments.

(e) determining staff needs of the department and internal distribution of work among members of the staff to ensure adequate, effective and fruitful utilisation of teaching resources.

(f) encouraging the growth of professional competence of all staff members.

(g) evaluating the work of the staff members.

(h) collaborating with other departments in carrying out the college programme and ensuring that the department staff works as an integral unit of the college.

(i) initiating and promoting projects, studies and investigation, the results of which may help in the improvement of secondary education particularly, in the subject area with which the department is concerned.

(j) providing leadership to the department in maintaining a high level of scholarship, and a tone of dedicated service.

(b) *Administrative Officer* is responsible for the financial, business and establishment affairs of the College.

(c) *Hostel Superintendent* (warden) will be in charge of general supervision of hostel services.

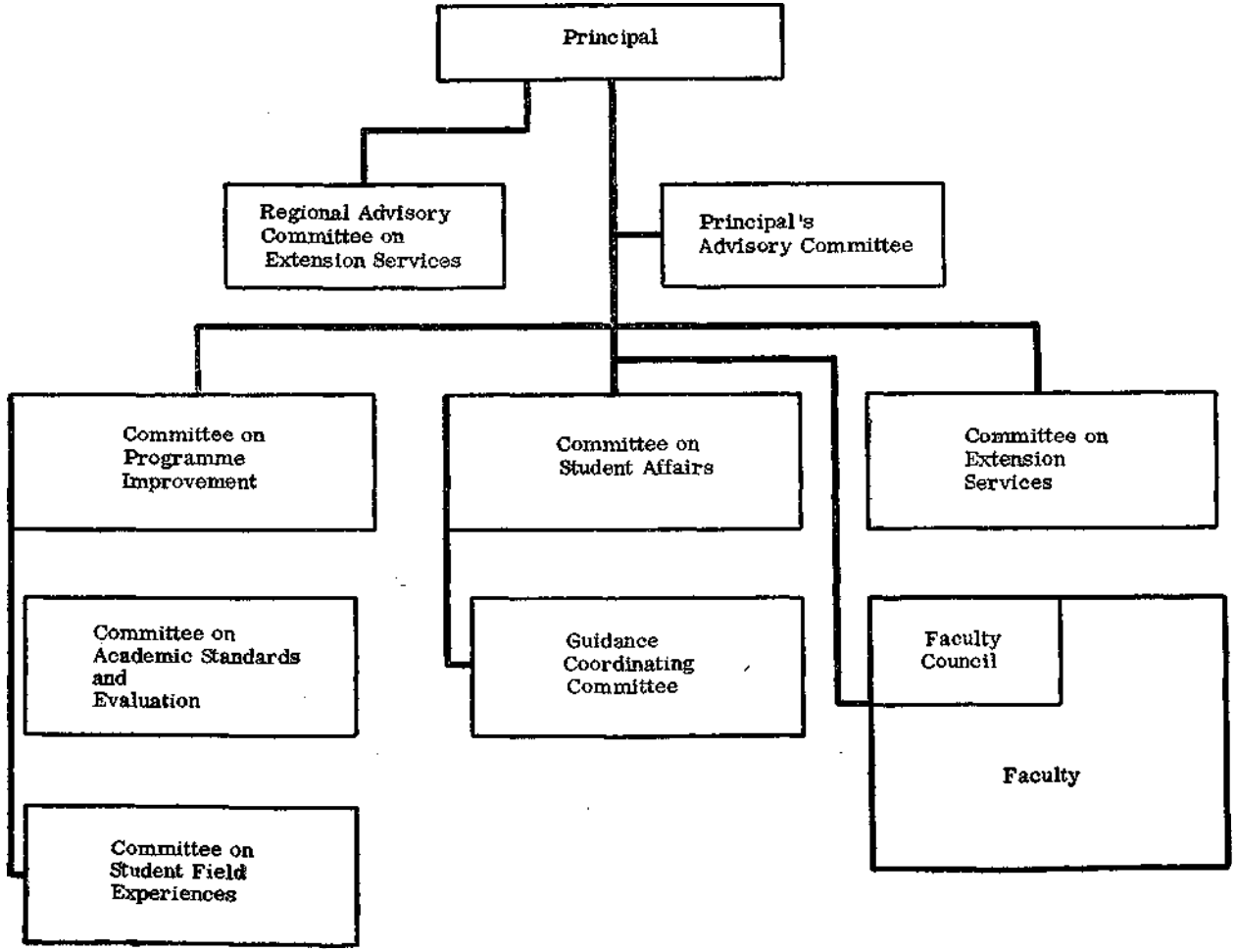
The Faculty and Student Committees. (see Chart II).

(a) *The Faculty.* The Faculty of each college includes all teaching staff. All meetings of the faculty will be convened by the Principal.

(b) *The Faculty Council.* When the Faculties increase to the size that general faculty meetings may not be practicable, a Faculty Council will be

Chart II

Standing Committees of the Colleges



established. The composition, powers and functions of the Faculty Council will be determined at the time of its establishment. The membership will be partly ex-officio, partly appointed, and partly elected.

Faculty Standing Committees : The following Standing Committees of the Faculty will be established at the appropriate time to report to the Principal all matters specifically referred to them. The membership of these committees will be partly ex-officio, partly appointed, and partly elected.

(i) PRINCIPAL'S ADVISORY COMMITTEE. This Committee will consist of the Principal, Vice-Principal, Administrative Officer, Heads of the Departments and elected representatives of the Standing Committees. The general functions of the Advisory Committee will be :

- to review and recommend policy decisions which affect the general administration of the college and the instructional programme ;
- to review all new programmes and courses ;
- to review committee reports ;
- to refer matters to the Faculty Council ;
- to give advice on such other matters as the Principal may bring to the Committee.

(ii) COMMITTEE ON PROGRAMME IMPROVEMENT. This Committee will advise on :

- the programme of instruction and guidance ;
- the development of instructional materials ;
- the programme for the professional growth of the staff.

This Committee will be assisted in its work by two sub-Committees :

Sub-Committee on Academic Standards and Evaluation. This sub-Committee will consider policies relating to standards of instruction and courses including internal and external evaluation, detention of students and University relationships.

Sub-Committee on Student Field Experiences. This sub-Committee will advise on all policy matters concerning student field experiences including school observation, community experiences and practice teaching.

(iii) COMMITTEE ON STUDENT AFFAIRS. This Committee will advise on student affairs including the hostel programme, student activities, students' self-government, and will serve as a coordinating agency for the guidance programme in the college.

(iv) COMMITTEE ON EXTENSION SERVICES. This Committee will advise on all policies concerning in-service programmes and will serve as a coordinating agency for the entire programme of extension services in the college.

(d) *Students' Council.* A Students' Council will be established as early as possible and its membership and functions determined by the Faculty

Council, and till such time as the Faculty Council is established by Principal's Advisory Committee. In general, the Students' Council will sponsor student activities and publications and participate in decisions involving various aspects of student community life on the campus.

(e) *Regional Advisory Committee on Extension Services.* This committee is not a part of the internal organization of the college, but is closely related to it. The programme of Extension Services in the college and the work of this committee are given in Part II–D.

B. PROJECTED ENROLMENT AND STAFF REQUIREMENTS

The estimated needs for administrative, instructional, clerical and service staff and personnel for each College have been projected in five sections listed below. These projections do not include the staff requirements of the demonstration multipurpose school :

Section 1 projects the enrolment for the colleges ;

Section 2 states the policy on teaching load and the bases for determining needs for instructional staff;

Section 3 suggests the administrative staff, the faculty, clerical and service personnel needed for the colleges at Ajmer and Bhubaneswar where four-year programmes, one-year programmes and inservice programmes will be operating ;

Section 4 suggests the administrative staff, the faculty, clerical and service personnel needed at the colleges at Bhopal and Myosre where only one-year and inservice programmes will be provided in the first instance ; and

Section 5 gives an analysis of the staff and office requirement.

Section 1—Projected Enrolment

The projected enrolment figures are based on three factors :

(1) The pace at which the building programme will proceed.

(2) The major needs of the States in each Region.

(3) The need for keeping enrolment at a level which will ensure intensive utilization of buildings, equipment and staff.

Tables 1 and 2 show the projected enrolment for the colleges at Ajmer and Bhubaneswar. This enrolment will provide appoximately 75 per cent utilization of classroom and laboratories.

Tables 3 and 4 project the enrolment of the colleges at Mysore and Bhopal, where the enrolment figures provide approximately 55 per cent utilization of classrooms and laboratories in the initial stages.

The staff requirements given in sections 2 and 3 are based on the enrolments shown in the Tables.

TABLE 1

PROJECTED ENROLMENT AT AJMER

	Number of Students				
	1st Year	*2nd Year*	*3rd Year*	*4th Year*	*5th Year*
	July, 1963	*July, 1964*	*July, 1965*	*July, 1966*	*July, 1967*
Science, 4-year Programme	—	70	125	175	225
Science, 1-year Programme	60	60	60	25	25
Technology, 4-year Programme	70	135	195	255	255
Technology, 1-year Programme	—	25	25	25	25
Agriculture, 1-year Programme	25	25	25	25	25
Commerce, 1-year Programme	—	25	25	25	25
Home Science, 1-yr. Programme	—	—	25	25	25
Crafts, 1-and 2-year Programme	—	25	50	50	50
Inservice (on campus at any one time)	45	50	50	50	50
Total	200	420	580	655	705

TABLE 2

PROJECTED ENROLMENT AT BHUBANESWAR

	Number of Students				
	1st Year	*2nd Year*	*3rd Year*	*4th Year*	*5th Year*
	July, 1963	*July, 1964*	*July, 1965*	*July 1966*	*July 1967*
Science, 4-year Programme	70	125	175	215	215
Science, 1-year Programme	60	60	50	25	25
Technology, 4-year Programme	70	135	195	255	255
Technology, 1-year Programme	—	50	50	25	25
Agriculture, 1-year Programme	—	25	25	25	25
Commerce, 1-year programme	—	25	25	25	25
Fine Arts, 1-year Programme	—	25	25	25	25
Crafts, 1-and 2-year Programme	—	25	50	50	50
Inservice (on campus at any one time)	50	50	50	50	50
Total	250	495	645	695	695

TABLE 3

PROJECTED ENROLMENT AT MYSORE

	Number of Students		
One-year Programmes only	*July, 1963*	*July, 1964*	*July, 1965*
Agriculture	25	25	25
Commerce	50	50	50
Crafts*	—	50	50
Home Science	—	—	25
Science	25	50	50
Technology	—	50	50
Inservice (on campus at any one time)	75	100	100
Total	175	325	350

*One and two-year programmes.

TABLE 4

PROJECTED ENROLMENT AT BHOPAL

	Number of Students		
One-year Programmes only	*July, 1963*	*July, 1964*	*July, 1965*
Agriculture	—	25	25
Commerce	—	50	50
Crafts*	—	50	50
Fine Arts	—	25	25
Science	—	50	50
Technology	—	25	50
Inservice (on campus at one time)	50	100	100
Total	50	325	350

*One and two-year programmes.

Section 2—Policy on Teaching Load and Bases for Determining Needs of Instructional staff.

The Regional Colleges of Education are residential institutions and hence are in a position to utilize facilities to maximum advantage in the learning-teaching programme. The library, workshops, and facilities for co-curricular activities will be available for a longer period each day and at more convenient hours of work than are usually available in day institutions. The faculty members will be responsible not only for lectures but also for seminars, tutorials counselling on an individual and group basis, supervision of student teaching, and participation in administrative duties as well as for undertaking research, writing, and special assignments in their own fields.

Each staff member should (a) be responsible for an assigned number of lecture and seminar periods per week, (b) be on campus for a *minimum period* each working day to be specified by the Principal for classroom, laboratory or workshop assignments, for individual counselling, tutorial work on an individual or small group basis, office and committee work, and (c) be available for such other duties as may be assigned by the Principal.

The staff needed for each college is based on the following considerations :

a. From sixteen to eighteen lecture and seminar periods per week plus administrative responsibilities, such as committee work, is considered a full-time load for a staff member, on the assumption that the staff will also be engaged continuously in planning and developing instructional materials, studies and investigations and similar activities bearing on their pofessional work.

In general, the size of a class has not been taken into consideration in calculating load, for it has been assumed that the size of classes will be within the range prescribed in 'b'. One lecture or seminar period has been reckoned as a 50-minute period (45 minutes class time plus 5-minutes interval between periods).

b. The size of a class is expected to be within a range of twenty to thirty-five students, except when two or more sections are put together in special teaching situations.

c. One and one-half laboratory periods have been considered equivalent to one lecture period.

d. Advising and counselling ten students is considered equal to one lecture period per week.

e. The administrative duties of a head of the department dealing with a one-year programme are considered as equivalent to four lecture periods per week. For the Department Head dealing jointly with a four-year programme and a one-year programme, the administrative duties have been considered equivalent to eight lecture periods per week.

f. for research writing and special assignments, the instructional load may if considered necessary be appropriately reduced by the Principal.

g. It will be necessary for most students to take their *Internship in Teaching* in schools located at distant points from the college. This will require the full-time responsibilities of the concerned staff members during the eight-week internship period. During this period, however, departmental staff members will be free to devote full-time to supervision. During this eight-week period, one staff member should not attempt to supervise more than ten students. However, the amount of travel involved and the quality of the cooperating teachers in the school where students are placed should be taken into consideration in determining the number of students that any one staff member can supervise effectively.

h. A minimum of one full-time staff member will be required in each department for inservice education. (N. B. This is for the purpose of estimating staff requirements only. The work-load of inservice education will actually be shared by all staff members.)

i. The regular academic year will be a minimum of 222 working days excluding final examination days.

j. The anticipated enrolment at the college when fully operating will conform closely to the enrolment figures indicated in Table 1.

k. The retention of students in the four-year technology programme would be as follows :

Beginning of 1st year	70
Beginning of 2nd year	65
Beginning of 3rd year	60
Beginning of 4th year	60

l. The students in the four-years technology programme are expected to group themselves as follows :

Option A	60%
Option B	40%

m. The retention of the four-years programme in science would be :

Beginning of 1st year	70
Beginning of 2nd year	65
Beginning of 3rd year	60
Beginning of 4th year	60

n. The enrolment of student in the science programme will be reduced from 70 students in July 1963 to 60 students in July 1964 because of limited laboratory space. The retention from 1964 onwards is estimated to be :

Beginning of 1st year	60
Beginning of 2nd year	55
Beginning of 3rd year	50
Beginning of 4th year	50

o. The students in the four-year science programme are expected to divide evenly between the physical and the biological sciences. In turn the physical science group would most likely divide evenly between the physics-chemistry option and the physics-mathematics option.

Section 3 — Staff Requirments : Ajmer and Bhubaneswar

The enrolment in the colleges at Ajmer and Bhubaneswar will increase each year for the first four years because of the two four-year programmes. The administrative staff requirements will be, therefore, be as follows :

Administrative Staff Requirements.

July, 1963	*July, 1967*
Principal	Principal
Vice-Principal	Vice-Principal
Administrative Officer	Administrative Officers
Counsellor	Counsellor
	Coordianator of Student Personnel Services
Coordinator of Student Field Experiences and Extension Services	Coordinator of Student Field Experiences and Extension Services
Librarian	Librarian
Curriculum Coordinator	Curriculum Coordinator
Director of Health, Physical Education, and Recreation	Director of Health, Physical Education and Recreation
Hostel Superintendent	Hostel Superintendent

Department heads are listed under instructional staff. Hostel Counsellor will be regular staff members to whom will be assigned hostel duties and thus they are included under the instructional staff.

Staff Student Ratio.

The following considerations are relvevant to the determination of the staff-student ratio :

ENROLMENT IN ONE-YEAR PROGRAMME. Although an enrolment of 25 students has been projected in several one-year programmes, in most cases the enrolment could be doubled without doubling the number of staff. For example, in technology, a minimum of three teachers is required because of the special competencies needed regardless of the number of students, but this number could easily be doubled if the demand should require it.

NATURE OF PROGRAMMES. The number of students that an instructor can effectively supervise in student teaching is relatively small. The fact that

the internship in teaching will be off-campus, and in many cases in other states, decreases the number of students that one staff member can supervise. In the one-year programme many students will require individualized remedial work. This also decreases the student-teacher ratio.

INSERVICE TRAINING PROGRAMME. The strength of staff has been calculated on the assumption that there would be a maximum of 50 inservice students on campus at ony one time at Ajmer and Bhubaneswar, and 100 students at Mysore and Bhopal. The equivalent of one staff member has been added to each department for inservice training. The teaching load involved in extension work which the college may organise off campus is not reflected in the student-teacher ratios.

SMALL CLASSES. The average class-size on which staff requirements has been calculated is 25 students. A maximum of 30 students per class has been stipulated, except in a very few cases. This will aviod large lecture classes and thus emphasize student-teacher contacts through class and small group discussions.

The staff student ratio calculated on the basis of considerations stated above works out as follows :

		Instructional Staff-Student Ratio	
		July, 1963	July, 1967
Ajmer	...	1 to 11	1 to 12
Bhubaneswar	...	1 to 11	1 to 12
Mysore	...	1 to 13	1 to 12
Bhopal	...	1 to 7	1 to 12

INSTRUCTIONAL STAFF, OFFICE AND SERVICE PERSONNEL REQUIREMENTS AT AJMER

	In position June, 1963	*To be added after June, 1963*
Instructional Staff		
Agriculture	2	2
Commerce	-	3
Education	3	8
English	2	1
Home Science	-	3
Physical Education	1	1
Regional Language	1	1
Science	2	11
Social Science	1	1
Technology	4	4
Staff, Workshop and Laboratory Assistants		
Agriculture	1	1

Commerce	–	1
Home Science	–	1
Physical Education	1	–
Science	2	2
Technology	4	–
Audio-Visual (Artist)	1	–
Service and Maintenance Personnel		
Agriculture	2	1
Technology	4	3
Office Personnel		
Administrative Officer	–	1
Office Superintendent	1	–
Accountant	1	–
Cashier	1	–
Accounts Clerk	1	–
Record Keeper	–	1
Store Keeper	1	–
Stenographer	1	–
Stenotypist	1	–
Typist	2	–
Upper Division Clerk	2	–
Lower Division Clerk	2	–
Duplicating Machine Operator	1	–
Peon	9	5
Library Staff		
Librarian	–	1
Assistant Librarian	1	–
Technical Assistant	1	–
Library Attendant	1	1
Health Clinic		
Physician (part-time)	1	–
Compounder-cum-dispenser	1	–
Other Personnel		
Sweeper	4	2
Cleaner	6	4
Frash	1	1
Chowkidar	4	2
Daftary	1	–
Mali	3	–
Driver	1	–

INSTRUCTIONAL STAFF, OFFICE AND SERVICE PERSONNEL REQUIREMENTS AT BHUBANESWAR

	In position June, 1963	*To be added after June, 1963*
Instructional Staff		
Agriculture	1	3
Commerce	–	3
Education	3	8
English	2	1
Fine Arts	–	3
Physical Education	1	1
Regional Language	3	1
Science	4	9
Social Science	1	1
Technology	4	4
Staff, Workshop and Laboratory Assistants		
Agriculture	1	1
Commerce	–	1
Fine Arts	–	3
Physical Education	1	–
Science	4	–
Technology	4	–
Audio-Visual (Artist)	1	–
Service and Maintenance Personnel		
Agriculture	–	3
Technology	4	3
Office Personnel		
Administrative Officer	–	1
Office Superintendent	1	–
Accountant	1	–
Cashier	1	–
Accounts Clerk	1	–
Record Keeper	–	1
Store Keeper	1	–
Stenographer	1	–
Stenotypist	2	–
Typist	2	–
Upper Division Clerk	2	–
Lower Division Clerk	2	–
Duplicating Machine Operator	1	–
Peon	9	5

Library Staff		
Librarian	-	1
Assistant Librarian		-
Technical Assistant	1	-
Library Attendant	1	-
Health Clinic		
Physician (part-time)	1	-
Compounder-cum-dispenser	1	-
Other Personnel		
Sweeper	4	2
Cleaner	5	6
Frash	1	-
Chowkidar	-	1
Daftry	3	-
Mali	3	-
Dhobi	1	-

Section 4—Personnel Requirements: Bhopal and Mysore

The staff and service personnel requirements for the colleges at Bhopal and Mysore are based on a projected maximum enrolment of 350 students. If the enrolment is increased in the future, additional staff would be required.

Administrative Staff Requirements for July, 1963.

Principal

Vice Principal

Administrative Officer

Counsellor

Coordinator of Extension Services and Student Field Experiences

Librarian

Director of Health, Physical Education, and Recreation

Hostel Superintendent.

The Coordinator of Student Personnel Services would be a member of the Psychology Department and is included under the instructional staff.

The Coordinator of Curriculum will be a member of one of the instructional departments and is included under the instructional staff.

Hostel Counsellors are regular staff members assigned hostel duties and thus they are included under instructional staff.

INSTRUCTIONAL STAFF, OFFICE AND SERVICE PERSONNEL REQUIREMENTS AT MYSORE

	In position June, 1963	*To be added after June, 1963*
Instructional Staff		
Agriculture	2	2
Commerce	3	1
Education	4	4
Home Science	–	3
Physical Education	1	–
Science	2	2
Technology	1	4
Staff, Workshop and Laboratory Assistants		
Agriculture	1	1
Commerce	1	–
Home Science	–	1
Physical Education	1	1
Science	2	1
Technology	–	1
Audio-Visual (Artist)	1	–
Service and Maintenance Personnel		
Agriculture	2	1
Technology	–	6
Office Personnel		
Administrative Officer	–	1
Office Superintendent	1	–
Accountant	1	–
Cashier	1	–
Accounts Clerk	–	1
Store Keeper	1	–
Stenotypist	–	1
Typist	2	–
Upper Division Clerk	1	1
Lower Division Clerk	2	1
Duplicating Machine Operator	1	–
Peon	5	4
Library Staff		
Librarian	1	–
Assistant Librarian	–	1
Technical Assistant	1	–
Library Attendant	1	1

Health Clinic		
Physician (part-time)	1	–
Nurse	1	–
Other Personnel		
Sweeper	3	1
Cleaner	4	4
Frash	1	1
Chowkidar	3	3
Daftary	–	–
Mali	3	–
Driver	1	–

INSTRUCTIONAL STAFF, OFFICE AND SERVICE AND PERSONNEL REQUIREMENTS AT BHOPAL

	In position June, 1963	*To be added after June, 1963*
Instructional Staff		
Agriculture	–	4
Commerce	1	4
Education	4	4
Fine Arts	–	3
Physical Education	1	1
Science	–	4
Technology	–	5
Staff, Workshop and Laboratory Assistants		
Agriculture	–	2
Commerce	–	1
Fine Arts	–	3
Physical Education	–	1
Science	–	3
Technology	2	3
Audio-Visual (Artist)	–	1
Service and Maintenance Personnel		
Agriculture	–	3
Technology	–	6
Office Personnel		
Administrative Officer	–	1
Offiice Superintendent	1	–
Accountant	1	–
Cashier	1	–

Accounts Clerk	–	1
Storekeeper	1	–
Stenotypist	1	1
Typist	1	1
Upper Division Clerk	–	1
Lower Division Clerk	1	1
Duplicating Machine Operator	–	–
Peon	2	7
Library Staff		
Librarian	–	1
Assistant Librarian	1	–
Technology Assistant	–	1
Library Attendant	1	1
Health Clinic		
Physician (part-time)	–	1
Compounder-cum-dispenser	–	1
Other Personnel		
Sweeper	2	2
Cleaner	2	6
Frash	1	1
Chowkidar	3	3
Daftary	–	1
Mali	1	2
Driver	1	–

Section 5—Analysis of Staff Requirements

Workshop in Teaching

The major units of this course are guidance, school organization and administration, school health, and evaluation. It is expected that team teaching will be used in dealing with these units. Staff members concerned with professional education, physical education, guidance, and other special areas will be used to teach these units. In calculating the staff requirements for these areas, time taken for the teaching of units in the courses on *Workshop in Teaching* has also been taken into consideration.

One-year and Inservice Education Programmes

A minimum of three staff members has been provided in each area to staff the one-year programme in it. In those areas in which there are to be 50 one-year students, four staff members have been provided. The equivalent of one staff member has been allocated to each department for inservice education programmes.

The one-year programme provides for an afternoon block (a minimum of 20 periods per week to be devoted to the special areas). This block of time is to cover methods of teaching, review of subject matter, development of additional skills and knowledge, and observation and participation in the classroom.

In addition, the staff of each department will be required to :

(a) supervise the internship in teaching,
(b) conduct inservice education programmes,
(c) participate, when needed, in the *Workshop in Teaching*,
(d) work with the Instructional Materials Centre in the development of instructional materials,
(e) give guidance and direction to the experimental programmes in the demonstration multipurpose school, and
(f) contribute to the research programme of the department and college.

Internship in Teaching

The one-year students will do most of their student teaching off campus. All students in any one area will do their student teaching at one time, thus releasing the staff in each special area to supervise student teaching.

The students will be divided into two groups, Group A and Group B. Each group will have an eight-week teaching practice. During this eight-week period they will spend full time on their student teaching assignment and will not attend college classes. Group A will start its student teaching experience at the beginning of the 15th week. Group B will be scheduled for student teaching at the beginning of its 23rd week in college. Thus Group B will be on campus while Group A is teaching, and Group A will be on campus while Group B is teaching.

All courses, except special methods and special content courses in each field, will be divided into two sections. Section I will be made up of those students who will have their student teaching in Group A. Section II will be made up of those students who will do their student teaching in Group B.

For example, there will be two (or more) sections of Agriculture, Commerce, Science or any other subject. Section I will run for the first 14 weeks and adjourn for the next eight weeks while its members are teaching, and then reconvene for the last 15 weeks of college. Section II will run for the first 22 weeks, adjourn for the next 8 weeks, and reconvene for the last seven weeks of college.

It will not be necessary to divide special methods and special content courses into sections as all students in a given area will be in the internship at the same time.

TABLE 5.

INTERNSHIP IN TEACHING

Group A	On Campus 14 weeks	Student Teaching 8 weeks	On Campus 15 weeks		Total weeks 37
Group B	On Campus 22 weeks		Student Teaching 8 weeks	On Campus 7 weeks	Total weeks 37

COLLEGE YEAR AND TIME TABLE

The college year and daily schedule given in this section are suggestive. The Principal and his staff may make such adjustments as may be found necessary to meet the schedule of examinations of the University concerned.

Academic Year

The number of days that students attend classes in most colleges in India, as well as in many other countries, is less than 200 days per year. There is a growing trend in higher education in all countries to increase the year so as to provide better utilization of human and physical resources and also to increase the scope and depth of education. The breadth of knowledge and skills needed by teachers to teach in the modern secondary schools makes such an increase in the college year indispensable. An increase of 20 per cent to 30 per cent in the length of the college year would meet this need and still provide liberal holiday periods and vacations for both students and faculty.

The regional college programme has, therefore, been planned on the basis of a college year of 222 days of instruction, *excluding* the final examination days. The year's schedule will be as follows :

37 weeks (6 days per week) of instruction	Total 222 days instruction
2 weeks for annual examinations	Total 14 days
4 weeks for vacation days during academic year	Total 29 days
Sundays	Total 37 days
9 weeks vacation between academic years	Total 63 days
Total 52 weeks	365 days

College week

The college schedule based on a six-day week is as follows :

Monday to Friday— scheduled classes

Saturday morning— co-curricular activities and individual work in laboratories

Saturday afternoon— recreation and sports activities

This weekly schedule will require all staff members to be on duty for 5½ days each week. On Saturday mornings the staff will do counselling,

ONE YEAR PROGRAMME

PLACE OF INTERNSHIP

GROUP A	ON CAMPUS COURSE WORK 14 WEEKS	OFF CAMPUS INTERNSHIP IN TEACHING 8 WEEKS	ON CAMPUS COURSE WORK 15 WEEKS
GROUP B	ON CAMPUS COURSE WORK 22 WEEKS	OFF CAMPUS INTERNSHIP IN TEACHING 8 WEEKS	ON CAMPUS COURSE WORK 7 WEEKS

operate and supervise the laboratories, and direct co-curricular activities. Saturday morning activities will be initiated and organized mainly by students, with only a few staff members on duty.

Daily Schedule

The daily schedule is based on the following assumptions :

(1) Classes will be scheduled only for five days per week.

(2) Saturday morning will be used for co-curricular activities and supplementary work in the laboratories.

(3) Co-curricular activities and sports events will be scheduled for Saturday afternoons.

(4) The class period will be 45 minutes in length with a five-minute interval between periods.

(5) Health, Physical Education, and Recreation will be given for 30 minutes in the morning and 70 minutes in the evening five days per week, thus providing the equivalent of approximately 11 periods per week for physical education.

Suggested Daily Time Schedule (Monday to Friday)

Activities	*Time*
Health and Physical Development	6.15— 6.45 a.m.
First Period	8.00— 8.45 a.m.
Second Period	8.50— 9.35 a.m.
Third Period	9.40—10.25 a.m.
Fourth Period	10.30—11.15 a.m.
Fifth Period	11.20—12.05 p.m.
Lunch	12.05— 1.20 p.m.
Sixth Period	1.20— 2.05 p.m.
Seventh Period	2.10— 2.55 p.m.
Eighth Period	3.00— 3.45 p.m.
Ninth Period	3.50— 4.35 p.m.
Free Time	4.35— 5.50 p.m.
Health, Physical Education and Recreation	5.50— 7.00 p.m.

Provision for Independent Study

One of the objectives in developing the proposed daily schedule is to provide the student with scheduled and unscheduled time during the school day which he can devote to library work, individual study and individual conferences with tutors.

The time schedule provides for a total of 55 class periods each week from Monday to Friday, including the periods scheduled for Health, Physical Education, and Recreation. The proposed four-year programmes in science

and technology commit the student to attending classes from 41 to 44 periods per week. Thus each student will have approximately two unscheduled periods during the school day for study, library work and conferences. In addition, students would have afternoons, evenings, Saturdays and Sundays for individual work.

Although the time table does provide some unscheduled time which the student can devote to independent study and investigation, it is still inadequate. If students are to assume more responsibility for the direction of their own education, the daily schedule must give them time for self-directed activities. It is hoped that after experimenting with the proposed four-year programmes in science and technology, ways will be found to decrease the amount of time which the student is required to spend attending lectures and doing laboratory work.

D. STUDENT FIELD EXPERIENCES

The Student Field Experiences Programme is designed to apply and test all theories and principles taught in the total programme. Stated in broad terms, it is designed to give the prospective teacher basic experiences in a different setting, in working with the social organization of a community, in observing, assessing and helping a community development programme and other such experiences as are necessary for a successful teacher.

More specifically, its purpose is to provide the prospective teacher with professional experience as a member of a school staff and as a classroom teacher. In this experience, knowledge of his subject as well as of educational method and philosophy will be tested. *The Internship in Teaching* is the culminating experiences in the programme.

Field experiences will comprise both observation and participation activitites on the part of students and will be provided in a variety of settings, such as the Demonstration School, the local schools and the co-operating schools.

The comprehensive nature of this programme necessitates the cooperation of many individuals as indicated below :

Coordinator of Student Field Experiences : Is responsible for

1. the over-all organization and administration of the Student Field Experiences Programme ;
2. the coordination of the Student Field Experiences Programme of the various departments ;
3. the organization of seminars for the orientation of teachers of cooperating schools and periodic seminars and a continuous evaluation of the programme ;
4. establishment of desirable working relationships between the Regional College and the cooperating schools.

State Departments of Education and Extension Services Centres :

The State Departments of Education and the Extension Services Centres in the regions have a major role in the organisation and successful implementation of the Field experiences Programme, specially in :

1. suggesting suitable cooperating schools in the area for implementing the programme ;
2. assigning student teachers to selected schools ;
3. making housing arrangements for student teachers in the various communities ;
4. assisting in overall planning and development of the programme of internship in teaching ;
5. providing other available and desirable services and facilities.

Teaehers of Cooperating Schools : They will

1. provide assistance to student teachers in planning, conducting and evaluating professional experiences ;
2. provide a suitable setting for teaching experiences through a continuous improvement of the school programme ;
3. assist in the overall planning and development of the internship programme ;
4. participate in a programme of professional growth on a formal and informal basis.

Staff of the Demonstration School : They will

1. provide a model setting for student observation ;
2. assist in planning, conducting, and evaluating observation and participation experiences for students ;
3. assist in the overall planning and direction of the programme.

College Staff : They have responsibility for

1. developing Field Experiences Programme within their respective departments. ;
2. guiding, supervising and evaluating the activities of student teachers ;
3. organising seminars for cooperating teachers in their departments ;
4. providing leadership in the continuous improvement of the Student Field Experiences Programme ; and
5. establishing desirable working relationships between the Regional College and the cooperating school.

Headmasters of the Cooperating Schools : They will

1. provide assistance to the internship programme by working with student teachers, and
2. assist in the evaluation of student teachers.

The Operation of the Internship Programme

The part of the programme which has been termed 'internship' envisages the student working over a continuous period of time with the staff of a school in his state. A distinctive term has been given to this arrangement to distinguish it from the usual practice teaching by the fact that the student is initiated to his first experience as a teacher in a school.

The success of internship as a part of the Student Field Experiences Programme will depend upon the selection of a group of good cooperating schools. These schools are to be selected in each of the states comprising the region served by the college. This will enable students to return to their home states for internship experience. A sufficient number of schools will be selected wherever possible to allow for the placement of one student in each department.

The following criteria will guide the selection of cooperating schools :

1. Willingness on the part of the school management and the staff to participate and assist in the programme of student field experiences.
2. Breadth and quality of the total programme of the school and of the department or departments selected for internship of students.
3. Availability of suitable housing arrangements for student teachers.
4. The training, experience and competence of the teachers in the selected departments.
5. The provision of adequate physical facilities in the department.

The development of the programme will depend upon careful planning, execution and a constant process of evaluation. Continuous inservice education for the personnel involved is also essential to ensure that they fully understand and appreciate the professional significance of the programme and their part in it. An initial seminar will be provided at each Regional College of Education for orienting the teachers of the cooperating schools to their expected role. This seminar will deal with methods and techniques which are to be used by cooperating teachers and with planning the course on Internship in Teaching. The seminar will be conducted by the Coordinator of Student Field Experiences with the assistance of the college personnel.

In addition, periodic seminars will be organised for cooperating teachers and others involved in the Student Field Experiences Programme to insure the continued development of the programme.

The strength of the entire programme will doubtless depend upon the cooperative efforts of all the personnel involved. Planning, execution and evaluation of all experiences included in the programme should be done cooperatively, and the individual performance of the students during these

experiences should be jointly evaluated by college personnel and the personnel of the cooperating schools.

E. GUIDANCE PROGRAMME AND SERVICES

Place of Guidance in the College Programme

The guidance programme is recognised as an essential element in any educational programme but it is especially important in a programme that proposes to integrate professional, general and content education.

Guidance in the college will not be confined to the formally organized guidance programme. In a broad sense, there are several courses which contribute to guidance. The courses in general and educational psychology are designed to deal with basic concepts such as personality development, learning and the psycho-dynamics of human behaviour. There is a major professional unit on guidance in the course entitled *Workshop in Teaching*. Guidance will be stressed in special methods courses and in *Internship in Teaching*. The college will also offer inservice programme in guidance for teachers and administrators.

Organisation

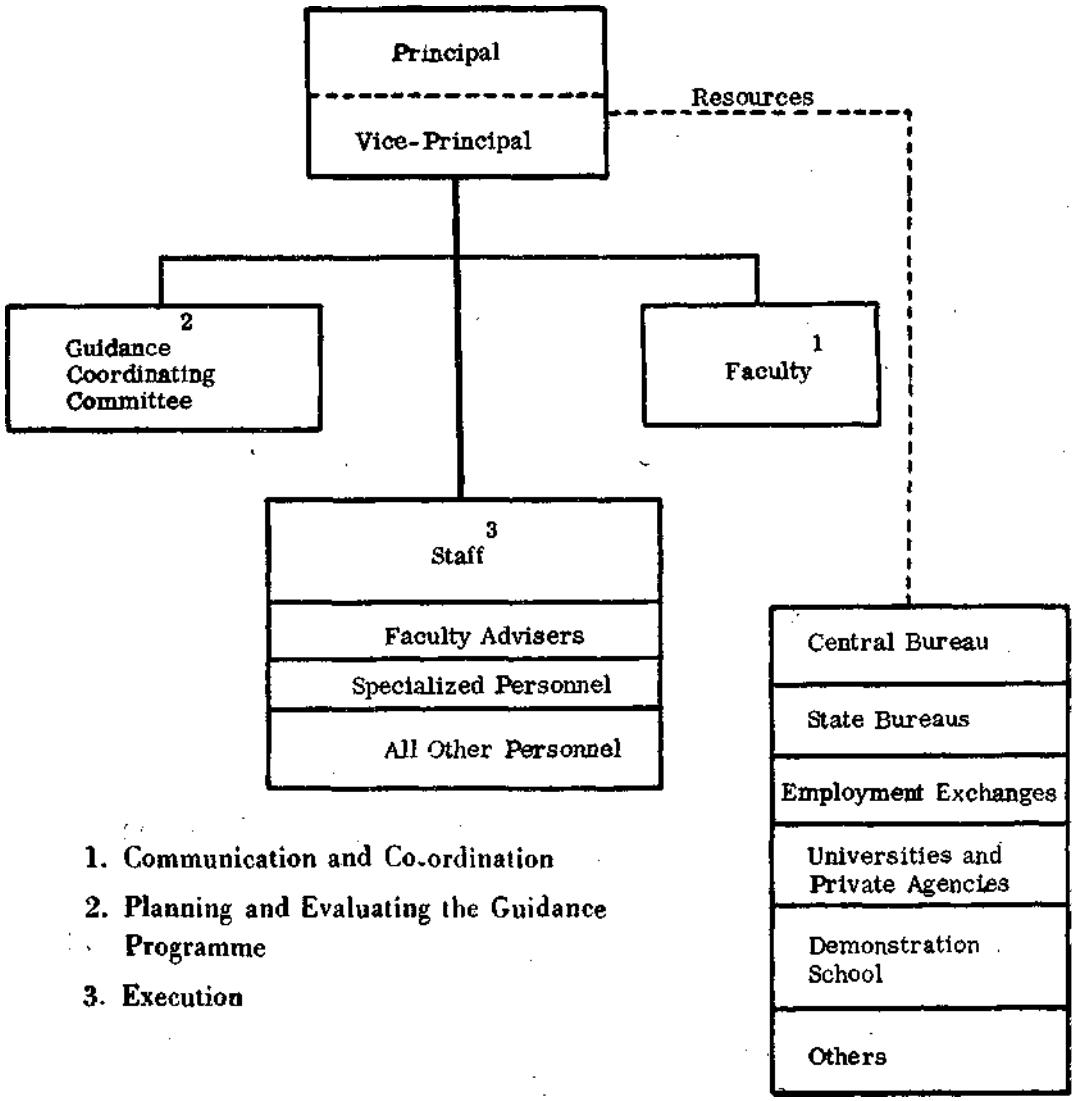
The college and the demonstration school will each have its own guidance programme. Certain inter-relationships, however, exist between the two programmes and are specified elsewhere. Staff from both the college and the demonstration school will participate in the inservice programme in guidance organized by the college.

The organization of the guidance programme of the college is shown in Chart III.

Objectives of the Guidance Programme : These are

a. to interpret the educational programme, including guidance, to the community and the teachers in the community ;
b. to orient students to the college setting and the college programme ;
c. to provide assistance to students in making personal and social adjustments ;
d. to assist students in developing an understanding of their abilities and interests and in making the best use of their potential abilities ;
e. to assist students in planning their programmes and preparing themselves for their educational careers ;
f. to develop skills and attitudes and to provide the learning experiences necessary to prepare student teachers for active participation in the guidance programme of the schools in which they will work ;
g. to contribute to the placement programme.

Chart III-Organisation of the Guidance Programme of the Regional College of Education



1. Communication and Co-ordination
2. Planning and Evaluating the Guidance Programme
3. Execution

College Guidance Activities

a. *Maintenance of Record System*

(*i*) Individual data should be collected from academic records, admission interviews, test records, application forms, etc.

(*ii*) Firm procedures should be established to collect data and maintain them in each individual record.

b. *Orientation of Students*

(*i*) to the college setting and its programme ;

(*ii*) to educational choices ;

(*iii*) to the guidance programme ;

c. *Guidance Services*

(*i*) helping students in selecting options ;

(*ii*) assisting students with their personal problems ;

(*iii*) referring students for special help to outside agencies ;

(*iv*) helping students plan their future ;

(*v*) helping in the placement of graduates passing out of the college ;

(*vi*) helping in planning co-curricular activities ;

(*vii*) providing a library of educational and vocational information including brochures, posters, and audio-visual aids ;

(*viii*) providing standardized educational and psychological tests to be used for study by teachers and for individual or group administration for the guidance of students ;

(*ix*) coordinating, under the Principal, other student personnel services related to health, social adjustments, financial assistance, etc. ;

(*x*) giving guidance and placement assistance to students who drop out in the middle of the course.

Role of College Personnel in Guidance

The Principal

1. guides and supervises the over all organisation of the guidance programme ;
2. helps the staff identify the problems, needs and characteristics of students and in understanding the shared responsibility of all for pupil growth ;
3. provides personal leadership and help in developing better guidance services ;
4. helps to define and clarify the administrative structure, lines of action, and job descriptions and organisation of the guidance programme ;

5. helps to interpret the programme of guidance services to the school and the community ; and
6. provides inservice education facilities to assist teachers and counsellors to acquire greater skill.

Vice-Principal

Assists the Principal in guiding and supervising the guidance programme.

Coordinator of Student Personnel Services

1. gives specific leadership to and coordinates the guidance programme ;
2. takes responsibility for running and supervising the guidance office ;
3. takes responsibility for maintaining the individual records ; and
4. supervises the student counselling programme.

Counsellor

1. implements the guidance programme as planned ;
2. does individual counselling—personal, educational, etc. ;
3. helps plan and evaluate the total guidance programme ;
4. helps plan and implement group guidance activities such as orientation programme ;
5. assists in the placement of students passing out of the college as well as those who drop out in the middle of the course ; and
6. assists in the inservice education programmes.

Hostel Counsellor

In addition to his duty as warden of his own hostel, he

1. helps plan the total guidance programme ;
2. provides individual counselling ;
3. helps plan and carry out the orientation programme in the hostels ; and
4. refers to the Coordinator of Student Personnel Services cases where his role as warden conflicts with his role as counsellor.

Faculty Adviser

1. assists through tutorial work ;
2. counsels on academic matters and those personal problems which are within the area of his competency ;
3. contributes data to the individual records ; and
4. takes general responsibility for students assigned to his group.

Staff

1. detect problems, needs and serious maladjustments of students ; and
2. provide instructional situations designed to promote maximum student development.

Guidance Coordinating Committee

This committee will be composed of

a. Vice-Principal

b. Coordinator of Student Personnel Services
c. Reader in Guidance
d. Counsellor
e. Hostel Counsellor
f. Representative of the instructional staff
g. Student representatives

Guidance Staff

The guidance staff for the colleges will consist of

1. Coordinator of Student Personnel Services
2. Reader in Guidance
3. Counsellor
4. Hostel Counsellor
5. Faculty advisers

It will be necessary to provide a full time clerk to serve the Guidance Office. The Counsellor and Coordinator of Student Personnel Services will be holders of a Master's degree in psychology or education with a degree or diploma in guidance and a teaching degree.

The Hostel Counsellor should be a trained graduate with a degree or diploma in guidance and preferably with experience in teaching.

Guidance Materials

The materials required for the guidance laboratory would include :

a. career materials on the profession of education ;
b. career materials for drop-outs ;
c. instructional materials to assist in the teaching of the unit on guidance in professional courses ;
d. relevant periodicals ;
e. relevant tests, test manuals, etc.

Psychometric Programme

Provision should be made for testing, especially, for the following :

Selection for admission.
Selecting optional subjects within a course.
Appraising students' personal problems.
Helping to place drop-outs.

F. INSTRUCTIONAL MATERIALS CENTRE

Since the Regional Colleges of Education are new types of institutions, the success of their instructional programmes and their influence on the multipurpose secondary schools must depend to a very great extent upon the development of new instructional materials. Teaching plans and

instructional materials are closely inter-linked. Therefore, the planning and development of instructional materials in each college should be done systematically and wherever possible, cooperatively.

To ensure good instruction in the colleges and good field services to multipurpose schools, each college will be expected to engage in the development of curriculum and instructional materials for wide distribution. In order to do so, an Instructional Materials Development Centre will be located in each of the four colleges. In addition, a Central Instructional Materials Services Unit will be established at the Centre.

The responsibility and initiative for the development of instructional materials rest with each college. After the materials have been developed, tried out and refined by the College Development Centre, they will be sent to the Cental Instructional Materials Services Unit for reproduction and extensive distribution.

College Instructional Materials Development Centres

The Principal of each college will be responsible for the improvement, planning and development of instructional materials in his own college.

The Committee on Programme Improvement (see Chart I) will provide leadership in the planning and coordination of the development of instructional materials.

The Coordinator of Curriculum will supervise the operation of the College Instructional Materials Development Centre and will maintain liason between the Committee on Programme Improvement of the College, Demonstration School, schools serving as experimenal centres, College Instructional Materials Development Centres in the other Regional Colleges, and with the Central Instructional Materials Services Unit.

Operation of Centre

Each College Instructional Materials Development Centre will carry out the following functions :

1. Maintain an up-to-date collection of curricular and instructional materials.
2. Set up projects for the development of materials as determined by the Curriculum Council of the college.
3. Assist staff members in the production of instructional materials for try-out and experimentation.
4. Serve as a laboratory for the production of instructional materials by students under the supervision of the instructor.
5. Give leadership in evaluating and testing instructional materials.

Staff for College Centres

Each College Instructional Materials Development Centre will be provided with the following staff:

curriculum coordinator
assistant
typist
artist
duplicating machine operator
clerk

Equipment for College Centres

Each Centre will be provided with the following basic equipment :

two typewriters (electric)
stencil duplicator (electric)
heavy duty stapler
writing board, stylus, and artist's equipment

Central Instructional Materials Services Unit

In order to coordinate the work of the four Instructional Development Centres and to reproduce and distribute the instructional materials over a wide range of secondary school teachers and pupils and training colleges, a Central Instructional Materials Services Unit will be established, suitably staffed and equipped. In the initial stages of the project and until the colleges get established, the Unit will take over the major responsibility for developing instructional materials, especially, those required on a priority basis. This will be done in close collaboration with the four colleges.

A Coordinating Committee composed of the four college principals, the four curriculum coordinators, and specialists from the Central Unit will be established. This committee will have the following functions and responsibilities :

1. Coordinate the programme of development of instructional materials that is being carried on in the four College Centres.
2. Determine what manuscripts are to be produced, rerpoduced and distributed by the Central Unit.
3. Establish, when needed, sub-committees and employ specialists, if necessary, to undertake special assignments for developing needed instructional materials.

Operations of the Central Services Unit

The Central Services Unit will be fundamentally a service unit. It will undertake the actual development of instructional materials only when so directed by the Coordinating Committee or other authority. Its major

functions will be :

to edit the manuscripts.

to provide those specialized services essential for converting manuscripts into good instructional materials, such as, editorial work, illustrations, layout and design.

to reproduce instructional materials.

to establish a sales and distribution system to get the materials into the multipurpose and secondary schools throughout the country.

Staff for the Central Services Unit

It is recommended that the Central Unit be provided the following staff:

instructional matarials specialist
machine operator (offset printing)
artist assistant
typist
binder
two lower division clerks
packer

Equipment for the Central Services Unit

The Central Services Unit will be provided the following equipment :

plate making equipment
offset press
stencil-type duplicator (electric)
two electric typewriters
plastic binding machine (automatic)
writing board, stylus and artist's equipment

Budget and Resources

The operational cost of the College Instructional Materials Development Centres will be included in the general budget of the college.

The operational cost of the Central Service Unit including staff will be provided by the National Council of Educational Research and Training through the budget of the Publications Unit.

Provisions should be made for the recurring and non-recurring items for the college units and for the Central Unit for such items as paper, printing, supplies, etc.

G. RECRUITMENT AND SELECTION OF STUDENTS

The success of the Regional Colleges of Education depends upon the quality of the students they attract and select. Certain general guide lines are given here and it is expected that the details of selection procedure will be

formulated by the Principals within the frame-work of the major policies laid down by the National Council of Educational Research and Training.

Inservice Education Programmes

Students for the various inservice short courses will be deputed by the State Departments of Education. These courses will be organized for teachers working in secondary and multipurpose schools, and for those who may or may not hold a teaching degree. Recruitment and selection will be a cooperative venture between the college administration and the State Departments of Education. The extension centres will assist in the identification of school personnel in need of inservice education. The allocation of seats among the states will be determined by the Management Committee.

One-year Programmes

The State governments will be requested to nominate untrained teachers from their respective states. The selection will be open to teachers in service as well as to persons outside the teaching profession. Final selection will be made by the Principal, Vice-Principal, and the head of the department concerned according to criteria established by the Management Committee. Priority for admission will more or less be in the following order : teachers in multipurpose schools, teachers in non-multipurpose schools, and persons outside the teaching profession.

As a part of the admission requirements, a bond will be executed by each student for service in the education profession.

Four-year Programmes

Students for the four-year programmes in science and technology will be admitted after successful completion of higher secondary school or its equivalent with science or mathematics or technology as optionals (elective). Only those with good academic record and aptitude for the teaching profession will be selected.

The students admitted to these programmes will be paid scholarships which should be sufficient to meet a fairly good standard of board and lodging and other requirements.

An appropriately constituted Selection Board will make the final selection of applicants. The Head of the Department concerned and the Guidance Counsellor will be associated with the process of selection at appropriate points. Selection will be made on the basis of comprehensive data collected from academic records, secondary school guidance records, application forms and interview.

As a pre-requisite to admission, all students must sign a bond to serve in

the education profession. Selection to the college implies admission only. Retention in the programme will depend on the student's performance from year to year which will be judged by external examinations and periodic internal evaluation.

H. EVALUATION

The importance of evaluation has been pointed out by a number of study groups. Evaluation, including methods of determining position and progress in the classroom as well as terminal examination, is, especially, significant in a new institution. In fact, bad methods of evaluation might stultify the development of the programme just as good methods of evaluation, developmental research and inservice education of staff might enhance it.

The Scheme of Examinations

The University concerned, as the degree-granting body, has the responsibility of being constantly assured that its affiliated institution maintains an effective standard of teaching.

In the beginning, the methods of evaluation of the Regional College of Education should not differ too greatly from existing practices. The need, however, for improving the total assessment procedure should be recognized. The position of the Regional Colleges of Education is based on the assumption that :

> Teaching, learning, and examining constitute an indissoluble trinity of functions in an academic community, and they must be related to each other, and to the objective which the educational process is desired to achieve.*

Experimentation and inservice education of the teaching staff should be used to develop new methods of evaluation and to prepare the staff for their use.

Emphasis should be placed on a gradual increase in internal and continuous assessment and a corresponding decrease in external and terminal examinations.

Subject to modification or alteration by the concerned Universities, the scheme of examination will be as follows :

One-year Programme—Examinations, Marks, Divisions

In order to qualify for a pass in the examination of the B.Ed. degree

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**Report on Examination Reform*, Published by the University Grants Commission, New Delhi, 1962.

a candidate should secure—

IN PART I

40 per cent minimum in the internal assessment in *each* subejct.

35 per cent minimum in the external examination in *each* subject.

40 per cent in the aggregate of the marks obtained in the internal assessment and external examination in all the papers combined.

IN PART II

50 per cent in the aggregate.

Requirements for divisions and distinctions will be determined as follows :

40 to 49 per cent (aggregate)	III Division
50 to 59 per cent (aggregate)	II Division
60 to 69 per cent (aggregate)	I Division
70 per cent and above (either in Part I or Part II or in the aggregate)	Distinction

TABLE 6

SCHEME OF EXAMINATIONS FOR THE ONE-YEAR COURSE IN TEACHER EDUCATION

	No. of Papers	Total Marks	Internal Assessment	External Examination
Philosophical and Social Foundations of Education Paper I	1	100	25	75
—do— Paper II	1	100	25	75
Workshop in Teaching	1	100	25	75
Psychological Foundations	1	150	40	110
Physical Education, Health, Recreation and Hygiene	—	50	15	35
Methods of Teaching	—	100	25	75
Internship (Practice Teaching)	—	300	300	—
Content	—	100	100	—
		1000	555	445

Four-year Programme—Examination, Promotions, Marks, Divisions

PROMOTIONS

1. A student will be eligible to appear in the examination of any paper if he has attended at least 80 per cent of the period allotted to that paper. Exceptional cases where the required attendance is less than 80 per cent but not less than 70 per cent may be reviewed by the Principal and the faculty.
2. A student is eligible for promotion from the first year to the second and from the second year to the third provided he does not fail in more than two papers and/or practical examinations.
3. To qualify for promotion, all papers in which a student has failed in one year must be passed by the student either in the supplementary or the annual examination during the following year.
4. Two consecutive failures in the theory and/or practical of any subject will disqualify a student for promotion to the next year.
5. Accumulation of failures in four subjects at any one time will disqualify a student for further education in the college. Exceptional cases may be reviewed by the Principal and the faculty at their discretion.
6. A student will be eligible for promotion to the fourth year on completely satisfying the requirements of theory and practical papers of the first three years.

SUPPLEMENTARY EXAMINATION

1. On failure in the final examination, a student will be eligible to sit in the supplementary examination provided he does not fail in more than two papers and/or practicals.
2. Two consecutive failures in theory and/or practical examinations of any subject will disqualify a student from appearing in any subsequent examination of this degree unless he produces a certificate of adequate preparation and attendance in the college from the college Principal.

MARKS AND DIVISION

1. A minimum of 40 per cent of marks will be required for pass in all theory papers.
2. A minimum of 50 per cent of marks will be required for pass in all practical examinations.
3. A minimum of 45 per cent of marks will be required in the aggregate of marks of all theory and practical papers.
4. Division in the final result declared will be determined as follows :

45 per cent to 59 per cent	II Division
60 per cent to 74 per cent	I Division
75 per cent or above	Distinction

TABLE 7

SCHEME OF EXAMINATION FOR THE FOUR-YEAR PROGRAMME IN TEACHER EDUCATION IN SCIENCE AND TECHNOLOGY

	No. of Papers	*Marks*		
		Internal	*External*	*Total*
		General Education		
		I Year		
Health, Physical Education and Recreation		10	15	25
English	1	25	75	100
		II Year		
Health, Physical Education and Recreation		10	15	25
English	1	25	75	100
Regional Language	1	25	75	100
Social Sciences	1	25	75	100
		III Year		
Health, Physical Education and Recreation		10	15	25
English	1	25	75	100
History of Science and Technology	1	15	35	50
		IV Year		
Health, Physical Education and Recreation		10	15	25
		Professional Education		
		I Year		
		Nil		
		II Year		
General Psychology	1	25	75	100
		III Year		
Problems of Indian Education	1	25	75	100
Workshop in Teaching	1	25	75	100
Educational Psychology	1	25	75	100
		IV Year		
Special Method-Science/ Technology	1	25	75	100

	No. of Papers	Marks Internal	External	Total
Philosophy & Sociology of Education	1	25	75	100
Internship (Practice Teaching)	...	300	...	300
	III Year			
1. Chemistry (Major)	1 Theory	25	75	100
	1 Practical	25	25	50
2. Physics (Major)	1 Theory	25	75	100
	1 Practical	25	25	50
3. Botany (Major)	1 Theory	25	75	100
	1 Practical	25	25	50
4. Zoology (Major)	1 Theory	25	75	100
	1 Practical	25	25	50
5. Mathematics (Major)	2 Theory	30	120	150
	IV Year			
1. Chemistry (Major)	2 Theory	25 25	75 75	200
	1 Practical	50	50	100
2. Physics (Major)	2 Theory	25 25	75 75	200
	1 Practical	50	50	100
3. Botany (Major)	2 Theory	25 25	75 75	200
	1 Practical	50	50	100
4. Zoology (Major)	2 Theory	25 25	75 75	200
	1 Practical	50	50	100
5. Mathematics (Major)	3 Theory	20 20 20	80 80 80	300
	B. Technology Content			
1. Applied Mechanics and Engineering Materials	2 Theory	20 20	55 55	150
2. Engineering Drawing	—	50	—	50
3. Workshop Technology and Practice	—	100	100	200
4. Unified Physical Science	1 Theory	25	75	100
	1 Practical	25	25	50
5. Mathematics (Ancillary)	1	25	75	100

		No. of Papers	Marks Internal	External	Total
		II Year			
1.	Applied Mechanics and Engineering Materials	1	10	40	50
2.	Engineering Drawing	1	25	75	100
3.	Workshop Technology and Practice	—	100	100	200
**		*III Year (Engineering Science Group)*			
1.	Workshop Technology and Practice	—	100	100	200
2.	Elements of Engineering	—	25	75	100
		IV year (Engineering Science Group)			
1.	Workshop Technology and Practice	—	100	100	200
2.	Drawing & Design	—	50	—	50
3.	Elements of Engineering	2	50	150	200
		III Year (Engineering Trade Group)			
1.	Workshop Technology and Practice	—	100	100	200
2.	Engineering Trade (Major)	1	100	100	200
		IV Year (Engineering Trade Group)			
1.	Workshop Technology and Practice	—	100	100	200
2.	Introduction to Engineering	1	25	75	100
3.	Engineering Trade (Major)	1	100	100	200
** 4.	Unified Physical Science	1 Theory	25	75	100
		1 Practical	25	25	50
5.	Mathematics (Ancillary)	1	25	75	100

PART III

COLLEGE INSTRUCTIONAL PROGRAMME

A. THE FOUR-YEAR COURSE

The four-year programme for prospective teachers of science and of technology teachers is based on careful study of the needs of secondary schools in India and of the recommendations of several study committees. It differs from the traditional course in the following ways :

1. It is a coordinated four-year course as opposed to a three-year degree course plus a one-year professional course. The total programme is invisaged as a professional programme with the main object of preparing teachers of science and of Technical subjects for the secondary schools.
2. General education, professional education, and content are integrated in the four-year sequence. Professional education starts with psychology in the second year and terminates with "internship" in teaching in the fourth year. Care has been taken to maintain a balance between the time devoted to general education, professional education, and content.
3. Theory and practice are viewed as a single continuing process and not as two separate activities.

The administrative and organizational pattern of the college, college services and the daily, weekly and yearly schedules have already been described in Part II.

The policy of the college in respect of student evaluation as well as the examination for each course are covered in Part II (p. 48)

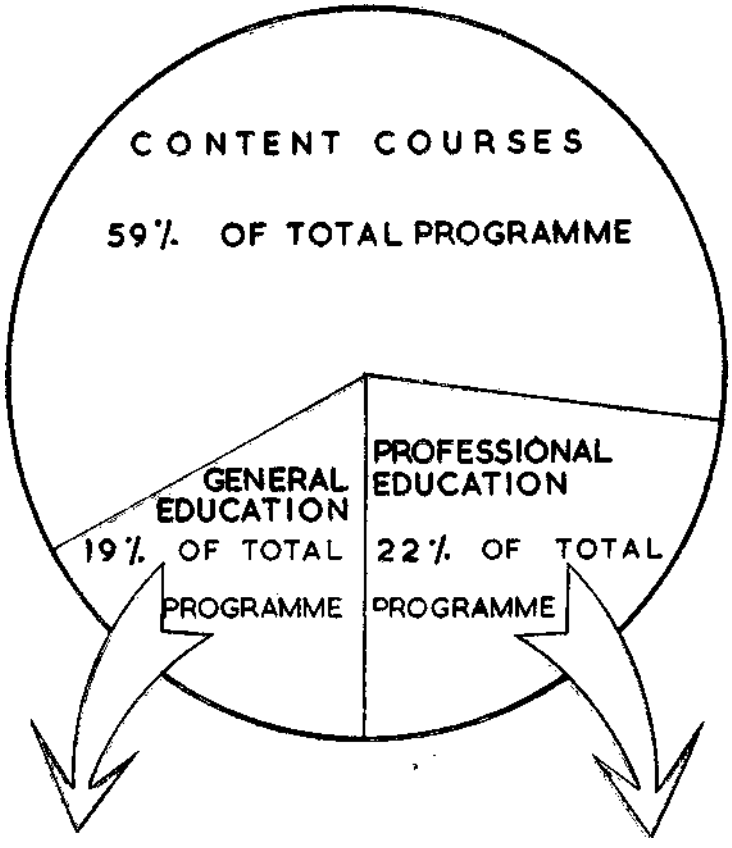
Curricular Scheme and Time Allotments

1. The curriculum is presented in terms of courses and sequences. The purposes and delimitations of the courses and sequences are meant to be followed closely while suggestions concerning methods, content, and evaluation are meant to be only suggestive.

2. General education is included in the four-year programme to introduce the student to the national heritage, man's creative expression and thought and also to world of recreation. General education however is viewed as part of the total curriculum and a deeper study of selected subjects, if properly handled is as much a liberalising influence, leading to insights into the relationship and unity of knowledge.

TIME ALLOTMENT

4 YEAR SCIENCE & TECHNOLOGY PROGRAMME



- LANGUAGES
- SOCIAL SCIENCES
- HEALTH PHYSICAL EDUCATION
- PSYCHOLOGY
- PROBLEMS OF INDIAN EDUCATION
- PHILOSOPHY & SOCIOLOG OF EDUCATION
- WORKSHOP IN TEACHING
- SPECIAL METHODS
- INTERNSHIP IN TEACHING

3. The curricular schemes and time allotments are presented in four different ways as follows :

a. Table 7. Curriculum and Time Allotments for Integrated Programmes in Science and in Technology.

b. Table 8. Curriculum and Time Allotments for General Education and Professional Education.

c. Table 9. Curriculum and Time Allotments for Science (Physical Sciences and Biological Sciences).

d. Table 10. Curriculum and Time Allotments for Technology (Engineering Sciences and Engineering Trades).

TABLE 7

CURRICULUM AND TIME ALLOTMENTS FOR INTEGRATED PROGRAMME IN SCIENCE AND IN TECHNOLOGY

Four-year Integrated Course in Science

	Periods per week (Combined Theory and Practice)				
Course/Year	I	II	III	IV	Total
Content (Major Science)	9	9	12	18	48
(Minor & Ancillary)	16	15(16)*	0	0	31(32)*
General Education	18	18	15	10	61
Professional Education	0	3	14	15	32
Total	43	45(16)*	41	43	172(32)*
*Biological Sciences Group					

Four-year Integrated Course In Technology

	Periods per week (Combined Theory and Practice)				
Course/Year	I	II	III	IV	Total
Content (Technology)	11	10	14	18	53
Unified Physical Science and Mathematics	14	13	0	0	27
General education	18	18	15	10	61
Professional Education	0	3	14	15	32
Total	43	44	43	43	173

TABLE 8

CURRICULUM AND TIME ALLOTMENTS FOR GENERAL EDUCATION AND PROFESSIONAL EDUCATION

General Education Programme

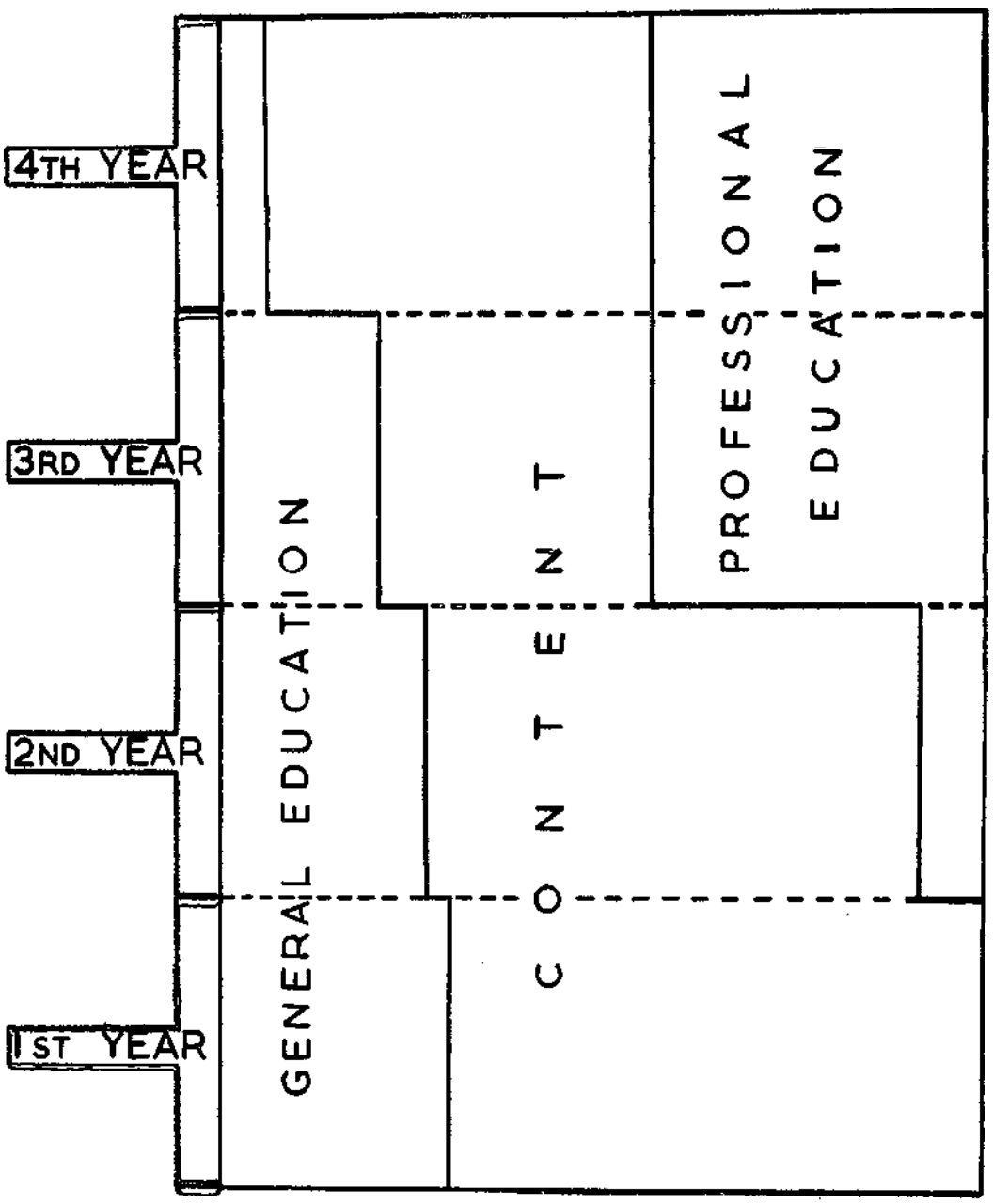
Course/Year	*Periods per week (Combined Theory and Practice)* I	II	III	IV	Total
English	6	3	3	0	12
Regional Language	2	2	0	0	4
Social Sciences	0	3	2	0	5
Health, Physical Education and Recreation	10	10	10	10	40
Total	18	18	15	10	61

Professional Education Programme

Course/Year	*Periods per week (Combined Theory and Practice)* I	II	III	IV	Total
General and Educational Psychology	0	3	3	0	6
Workshop in Teaching	0	0	5	0	5
Foundations and Problems of Education	0	0	2	2	4
Special Methods and Student Teaching	0	0	4	2	6
Internship in Teaching	0	0	0	11	11
Total	0	3	14	15	32

GENERAL EDUCATION CONTENT AND PROFESSIONAL EDUCATION ····· DISTRIBUTION OF TIME

4 YEAR SCIENCE & TECHNOLOGY PROGRAMMES



ALLOCATION OF TIME TO COURSES

TABLE 9

CURRICULUM AND TIME ALLOTMENTS FOR SCIENCE
(PHYSICAL SCIENCES AND BIOLOGICAL SCIENCES)

Physical Sciences Group

Course/Year	*Periods per week (Combined Theory and Practice)* I	II	III	IV	Total
MAJOR					
Physical Sciences (Physics & Chemistry) Or (Physics & Mathematics)	9	9	12	18	48
MINOR					
Mathematics	5	4	0	0	9
ANCILLARY					
Biological Sciences	9	9	0	0	18
Workshop Practice	2	2	0	0	4
Total	25	24	12	18	79

Biological Sciences Group

Course/Year	*Periods per week (Combined Theory and Practice)* I	II	III	IV	Total
MAJOR					
Biological Sciences	9	9	12	18	48
MINOR					
Physical Sciences (Physics & Chemistry)	9	9	0	0	18
ANCILLARY					
Mathematics	5	3	0	0	8
Physiology & Hygiene	0	2	0	0	2
Workshop Practice	2	2	0	0	4
Total	25	25	12	18	80

TABLE 10

CURRICULUM AND TIME ALLOTMENTS FOR TECHNOLOGY
(ENGINEERING SCIENCES AND ENGINEERING TRADE)

Engineering Sciences Group

	Periods per week (Combined Theory and Practice)				
Course/Year	I	II	III	IV	Total
Applied Mechanics and Engineering Materials	4	2	0	0	6
Engineering Drawing and Design	3	4	0	4	11
Workshop Technology and Practice	4	4	4	4	16
Elements of Engineering	0	0	10	10	20
Total	11	10	14	18	53

Engineering Trades Group

	Periods per week (Combined Theory and Practice)				
Course/Year	I	II	III	IV	Total
Applied Mechanics and Engineering Materials	4	2	0	0	6
Engineering Drawing	3	4	0	0	7
Workshop Technology and Practice	4	4	4	4	16
Introduction to Engineering	0	0	0	4	4
Engineering Trades Major	0	0	10	10	20
Total	11	10	14	18	53

GENERAL EDUCATION

SYLLABUS – GENERAL EDUCATION – ENGLISH

Year I/6 Periods/One Paper/100 Marks
Year II/3 Periods/One Paper/100 Marks
Year III/3 Periods/One Paper/100 Marks

Nature and Role of the Sequence

The objective of placing English in the field of General Education is to enable the student to have access to the thought and literature of an important foreign language and to develop in him the requisite skills in the use of the language. The student's general grasp of other subjects depends, to a large extent, on his comprehension of books and periodicals in English. The quality of his performance will be conditioned by the effectiveness with which he can express himself in English through the written as well as the spoken word. At the time of admission to the Regional Colleges of Education, the students may not have a very adequate mastery of English and they may not be able to handle even simple structures correctly.

Therefore, instructions in English should help them :

a. to develop an interest in reading good literature ;
b. to comprehend general and special reading materials ;
c. to develop vocabulary and felicity of expression, both spoken and written ;
d. to develop the ability to use the English language correctly and effectively.

Teaching Method

In order to assess the attainment of students on admission to the college, a test should be given to find out vocabulary and structures known to them, their comprehension of English, written or spoken, and their familiarity with reference techniques. It may reveal the common mistakes of sequence of tenses, use of articles, word order and concord in the sentence. Special coaching should be given to remove these weaknesses.

Emphasis should be laid on the rapid development of students' vocabulary. The language materials should be so organized that students gain a mastery over 6000 essential words and the ability to use correctly the most frequent verb-forms. The P.U.C. word lists prepared by the Central Institute of English, Hyderabad, the *Monograph on Verb-form Frequency Count* by Mr. H.V. George and published by the C.I.E. Hyderabad, and Zandvoort's *Handbook of English Grammar* will be found useful for the purpose. Discrimination between similar words and word formation may be emphasized.

The work in the classroom should go on in small tutorial groups wherever practicable, and enough opportunities shoud be provided for group discussions, speaking to the class, composing dialogues and listening to good English speech for which tapes and records may also be used. Students should be trained in the use of reference material like dictionaries, encyclopaedias, index and content lists, the library and card catalogues, tables and charts.

Sufficient written exercises in quick comprehension and correct expression should be done and self-correcting worksheets may be used for the purpose. In order to make writing work purposeful and useful, the students may be asked to write a few paragraphs with a given vocabulary or structural patterns and these written assignments may be related to the text books read, films seen and projects undertaken. Translation from English into regional language will improve comprehension. A list of technical terms and their equivalents in the regional language may be prepared by the students.

Students should be encouraged to read widely, and for their guidance a list of readings should be prepared. Credit should be given for any extra reading done outside the list. In such readings, the students should be trained in grasping the main idea, in discriminating between relevant and irrelevant details, in recognising incongruities in drawing conclusions, in predicting and evaluating.

Suitable recreational activities should be organized to improve students' English. Educational films and gramophone records, may be used and their themes discussed.

The students should be required to maintain a record of their general reading during the year.

Content

FIRST YEAR

Unit 1. Literature

a. INTENSIVE STUDY

(i) Van Loon *The Story of Mankind*

(ii) Fifteen Poems from Palgrave's Golden Treasury,

Cooper, W.	*To a Young Lady*
Campbell, T.	*Lord Ullin's Daughter*
Shelley, P.B.	*The Flight of Love*
Keats, John	*The Human Seasons*
Wordsworth, W.	*Upon Westminster Bridge*
Peacock	*The War Song of Dinas Vawn*
Patmore	*The Toys*
Bridges	*Nightingales*
Yeats, W.B.	*The Lake Isle of Innisfree*
Brooke, R.	*The Soldier*
Binyon, Lawrence	*For the Fallen*
Thompson, Francis	*In No Strange Land*
Thomas, Wylan	*This Bread I Break*
Arnold, M.	*The Future*
De La Mare, Walter	*Arabia*

b. General Study

1. Jerome K. Jerome, *Three Men in a Boat*
2. Butterfield, H., *The Origins of Modern Science*

Unit 2. Basic English Skills

a. Grammar review

b. Basic structures : word order in a complete sentence, sentence pattern, transformation of sentences, direct and indirect narration, spellings and punctuation, use of definite and indefinite articles.

c. Writing exercises : letters, personal travel accounts, simple descriptions and simple but complele essays, summarising, note taking, translation from English into Regional Languages.

References :

Zandvoort, R.W.	*A Handbook of English Grammar*
Martin, N.C.	*Understanding and Enjoyment, Book I* (Oxford)
Hill, L.A.	*Comprehension and Precis Pieces for Overseas Students* (Longman)

SECOND YEAR

Unit 1. Literature

a. Intensive Study

1. Shaw, Bernard, *Arms and the Man*

2. Songs 1—10 from *Gitanjali*

The following poems from contemporary verse edited by Kenneth Allott : *Penguin Poets*

Munro, Harold	*Living*
Dani Lewis, C.	*The Poet*
Spender, Stephen	*The Double Shame*
Lawrence, D. H.	*The Mosquito*
Cowen, Wilfred	*Insensibility*

b. GENERAL STUDY

i. Conant, *Science and Commonsense*

ii. Orwell, George, *Animal Farm Or 1984*

iii. *Factual English*—A compilation of specially prepared passages dealing with science and technology.

Unit 2. Language skills

a. Basic structures : sentence structure, order of words, concord of words, prefixes, and suffixes ; dimunitives, interrogative and indefinite pronouns, word formation, use of structure of word, including prepositions.

b. Writing exercises—writing a dialogue, discussion story, etc. precis writing, expansion of ideas, preparing newspaper reports, committee reports, business letters, translation and retranslation.

REFERENCES :

Zandvoort, R. W.	*A Handbook of English Grammar*
Martin, N. C. & Griffiths, D.	*Understanding and Enjoyment, Book II*
Gethin, R. H.	*Remedial English, Part I* (Oxford)

THIRD YEAR

Unit 1. Literature

a. INTENSIVE STUDY

Russell, B., *Impact of Science on Society*

Poetry.

The following poems from *A New Anthology of Modern Verse 1920–1940* by Day Lewis and L.A.G. Strong. Methuen & Co. London.

Bullett, Gerald	*Sudden Spring*
Drinkwater, John	*The Passing of a Stoic*
Macheice, Louis	*From Autumn Journal* (XXI)
Spender, Stephen	*I Think Continually of Those who were Truly Great*
Thomas, Dylan	*And Death Shall have no Dominion*

Yeats, W. B.	*An Acre of Grass*
Yeats, W. B.	*The Second Coming*
De La Mare, Walter	*Forests*
Blunder, Edmund	*Thames Gull*
Gogarty, Oliver St. John	*Time, Gentlemen, Time*
Day Leulis, C.	*From Ovetunes to Geath*
Herbert, Read	*The End of a War*

b. GENERAL STUDY

Maugham, S., *Of Human Bondage*

Evans, Ifor, *Science and Literature* (George Allen)

Unit 2. Language Skills

(a) Grammar—ancillary verbs, mood and modality; foreign words and phrases in common use, substitution of one word for many.

(b) Writing exercise : specialized writing, precis writing, press reports, lectures for different social occasions, social letters, notes and minutes, drafting the constitution of a student's body, translation of passages on technical and scientific subjects in regional language.

REFERENCES :

Zandvoort, R.W. *A Handbook of English Grammar*

Griffiths, D. and Griffths, A.M. *Understanding and Enjoyment*, Book III. Oxford University Press.

Burton, S. H. *A Comprehensive English Course*. Longmans.

Evaluation

There should be periodical tests to find out the progress of students. Credit should be given for reading and writing assignments as well as for participation in discussion, dialogues, and groupwork and general reading done by the students. University examination will be held at the end of each year.

SYLLABUS—GENERAL EDUCATION—REGIONAL LANGUAGE

Year I / 2 Periods / No Paper / No Marks
Year II/ 2 Periods / One Paper / 100 Marks

Nature and Role of the Sequence

Since students will be sent to their own states for their field experiences and since most students will return to their own states for employment, a sequence in regional languages is considered necessary to give the student sufficient competence in the use of the regional language as a medium of scientific thought. The number of languages provided will vary from college to college, depending on the number of major languages used in the respective regions.

The objects of the course are : (a) to study the literature of the language, (b) to study the cultural significance and relationships of the language, (c) to improve the quality of oral and written expression of the student, and (d) to teach such glossaries of scientific and technical terms as may exist in the regional language. (The meansings thus gained will be strengthened in the courses in which the terms are used.)

Teaching Method

Each student will study the language of his state. The methods of instruction will be determined by the requirements of the students. This implies a careful diagnosis of the students achievement in his mother tongue early in the first year and the drawing up of a individualised type of programme.

Content

Syllabuses are to be drafted by specialists. The following syllabus in Hindi should serve as an example in framing the syllabuses for other regional languages :

A. LITERATURE

a. INTENSIVE STUDY

Shyam Sunder Das, *Hindi Nibandha-mala*
Mishra, Dr. Baldeo Prasad, *Kavya-Kallol*

B. GENERAL STUDY

(a) Matadin, *Bharat Gaurava*
(b) Varma, Dr. Ram Kumar, *Teen Ekanki*
(c) Kapoor Shyam Narayan, *Bhartiya Vaigyanik*
(d) Bajpai, Prof. Nand Dularey, *Hindi Sahitya ka Sannshipta Itihas*

B. LANGUAGE

(*i*) Essay writing; unseen passages for comprehensive and precis writing, idiomatic expressions.

(*ii*) Correct language writing : Ram Chand Varma's *Achhi Hindi*.

(*iii*) Translation of English passages on technical and scientific subjects into idiomatic Hindi; familiarity with the list of technical terms in Physics, Chemistry, Mathematics, Botany, Zoology, Engineering, etc., published by the Government of India.

One paper on the regional language will be given at the end of the second year. Internal assessment will be made of students' achievements in assignments, classroom written tests, etc.

SYLLABUS—GENERAL EDUCATION—HEALTH, PHYSICAL EDUCATION AND RECREATION

Years I to IV/ 2 Periods/ One Paper / 100 Marks

Nature and Role of the Sequence

The sequence in Health, Physical Education and Recreation is designed to contribute primarily to general education. It will also contribute to the professional education of the student by providing opportunities for assuming leadership and responsibility in formal and informal recreational activities on the campus, in schools and in communities.

Two courses will be offered; namely, *Health and Physical Development*, a 30-minute course offered in the morning; and *Health, Physical Education and Recreation*, a 70-minute course offered in the evening.

While attendance at both courses will be obligatory, the course in *Health, Physical Education and Recreation* will be individualized to a very large extent.

The related course, *Workshop in Teaching*, contains a major professional unit dealing with health and human relations which will be based to a considerable extent on the general education courses in this sequence.

The purposes of the sequence are the following:

1. To develop useful, fundamental skills—
   Living safely and successfully—skills, such as walking, dodging, lifting, running, jumping, throwing, climbing and participation in activities which will have carry-over value—individual, dual and team sports, rhythmic exercises.
2. To establish, maintain and improve physical fitness and body development—strength, agility, flexibility, balance, coordination, endurance.
3. To offer opportunities to acquire interests, tastes and skills in recreational pursuits, such as, hunting, fishing, gardening and nature study.
4. To appreciate sports as a participant and a spectator by learning rules, scoring and strategy involved in the activities in which the student engages.

5. To provide opportunities for self-expression and creative ability through non-academic pursuits and for developing and perfecting a style of relaxation.
6. To develop the skills of listening, observing and following directions, such as, aircraft observation—particularly, acting as watch and ward.
7. To establish, develop and maintain good attitudes towards:
   a. personal health
   b. mental health
   c. family living
   d. community health
   e. safety in the home, school, community and at work
   f. first aid
   g. effects of alcohol, tobacco and drugs
   h. nutrition
8. To develop good sportsmanship by:
   a. getting along with others
   b. exhibiting humility in victory, graciousness in defeat
   c. evidencing loyalty to team or group
   d. competitive and cooperative spirit, as the occasion demands
   e. appreciation of a good performance by others
   f. initiative
   g. courtesy on and off the field
   h. ability to adapt to changing conditions
   i. self-confidence, self-control and emotional stability
9. To develop an understanding of the way in which scientific knowledge contributes to better health.
10. To recognize health improvement as a world problem and to encourage support of world-wide scientific and humanitarian efforts and organizations.
11. To encourage the individual to appreciate and support the work and services of local and state health and safety departments and volunteer organizations.

Teaching Method

The course in *Health and Physical Development* (30-minute period) will be designed to achieve growth and health largely through physical activity.

The 70-minute course in the evening is designed to cover primarily objectives of health and recreation. The first aid instruction will be based on the programme outlined by the St. John's Ambulance Unit. The school physician will help the departmental personnel with the instruction. Personal health, sex education, nutrition and utilization of health services can be

taught with the help of the school physician.

The biological and psychological bases of health and growth are taught in related courses and this background should be utilized.

Rifle practice can be worked out with the help of local rifle clubs. Scouting and guiding activities should be carried out with the help of resource people in the community.

The more specialized games must be taught by departmental personnel, but many games can well be taught by student leaders. The broad cultural activities can be taught by student leaders and interested staff members.

Content

The 30-minute sequence, based on physical fitness objectives should be broken into several units such as orientation, activities and evaluation.

The 70-minute sequence should consist of the following units formal and informal activities.

Unit 1. First Aid

This unit should be completed by the end of the first year. It should be based on the programme out-lined by the St. John's Ambulance Unit

Unit 2. Personal Health

a. Interpretation and evaluation of data concerning self
b. Sex education
c. Utilization of health services
d. Nutrition

This unit should be completed in the first year if possible but emphasis on achievement of objectives should extend throughout the four-year sequence

Unit 3. Leadership

a. Concept of leadership in a free society
b. Role of leadership in a free society
c. Learning—to give leadership to the activities in the 30-minute and the 70-minute periods
d. Applying learning to the secondary school situation

Unit 4. Games and other Recreational activities

Each student will be required to attain optimal efficiency in five games, two of which shall be major. Interest-building and skill-building will be the objectives.

Major Games—Cricket, hockey, football, volleyball, basketball, throwball, netball, badminton, tennicoit, tennis, table-tennis,

major Indian games and other ball games according to the playground facilities.

Activities—Athletics, swimming, apparatus work, gymnastics, intra-mural competitions, periodical physical fitness tests, sports-meets, scouting and guiding, rifle training, archery, folk dances and cultural activities.

Evaluation

The course in *Health and Physical Development* will be evaluated by National Physical Fitness tests, check lists, performance tests and other methods.

The internal assessment in the course in *Health, Physical Education and Recreation* will be based on all of the objectives of the sequence. Special assessing schemes should be developed to measure those accomplishments for which tests are not readily available.

SYLLABUS—GENERAL EDUCATION—SOCIAL SCIENCE

Year II / 3 Periods / One Paper / 100 Marks

Nature and Role of the Course

This course is designed as a broad integration of the various elements of the social sciences. The purposes of the course are to help the student to (a) develop an awareness of the social phenomena, (b) understand the central facts, events and forces that operate in society in terms of conceptual frameworks and the value premises or underlying assumptions and (c) appreciate the infinite variety and complexity of human aspirations and the potentialities for their fulfillment.

Teaching Method

Lecture, discussion, seminars and team teaching should be used according to the requirements of each unit. The account should be on extensive reading problem solving and integration of the various disciplines.

Content

Unit 1. Survey of History

a. Man's beginnings
b. Ancient civilizations—Egyptian, Greek, Roman
c. The Middle Ages and the Renaissance
d. The Modern Period and the Industrial Revolution—development of capitalism, nationalism, colonialism—the two World Wars and neo-totalitarianism, scientific invention, and the space age

Unit 2. Cultural Heritage of India

a. Cultural synthesis in Ancient India—Pre-Vedic, Aryan and Buddhist influences
b. Cultural synthesis during the medieval period
c. Impact of the West —British supremacy in Asia
d. Struggle for independence in India

Unit 3. Political Institutions

a. The concepts, development and forms of democracy
b. Comparative forms of government
c. Fundamentals of Indian Constitution and government system

Unit 4. Problems of National Unity

a. Secularism
b. Disintegrating and integrating influences
c. Emotional integration

Unit 5. Economic Development

a. Economic concepts including gross national product, capital growth, production, distribution, exchange, and consumption, and public regulation
b. Problems of planning and role of planning under various government systems
c. Economic development of India under successive Five-Year Plans

Unit 6. India and the World

a. India's cultural and economic relations with other countries
b. India and the United Nations—the role of the new Afro-Asian nations
c. India's international policies, problems and obligations
d. Current international problems
e. New power blocks

Evaluation

Evaluation should be based on (a) mastery of subject matter and, (b) the achievement of behavioural goals, such as, awareness, critical thinking, problem-solving leadership, voting, and participation in significant social movements. A variety of methods should be employed.

SYLLABUS—GENERAL EDUCATION—HISTORY OF SCIENCE AND TECHNOLOGY

Year III / 2 Periods / 50 Marks

Nature and Purpose of the Course

This course is designed to provide the students of science and technology with a historical perspective of their respective fields and the inter-relationships of these fields and an understanding of how the scientific method has been applied to increase man's knowledge of his environment and how technology has applied scientific knowledge to the world of work, thereby increasing man's ability to control his environment and to improve his standard of living.

Teaching Method

The course will be taught cooperatively by the staff of the social science, science and technology departments.

The survey nature of the course will make it essential to use a broad range of reference materials. Audio-visual materials will also be used to demonstrate or illustrate scientific principles and technological developments. Lecture-discussion will be the principle instructional method employed.

Content

Unit 1. The nature and early development of science and technology

a. The early beginning

b. The development of scientific thinking and methodology

c. Early technology based on chance discovery and trial and error, the development of technology based on science, the accelerating rate of change from muscle power to mechanical and electro-mechanical power

d. The inter-relationships of science and technology and their mutual interdependence

e. How contemporary science is limited by technological development and *vice versa*

Unit 2. The Nature and Philosophy of Modern Science

a. The impact of recent scientific discoveries

b. The philosophy of modern science and technology

Unit 3. The major scientific and technological developments and their influence on each other

a. Developments in biological science and subsequent technological developments in medicine, hygiene, sanitation, agriculture, diet, conservation (work of Harvey, Pasteur, Lister.)

b. Developments in physical science and subsequent technological developments in transportation, industry, agriculture, business, construction, communications (work of Bacon, Galileo, Watt, Bell, Marconi, Fulton.)

Unit 4. The impact of science and technology on man individually and on national and international developments

a. The inter-relationship of natural science, social science, and technology

b. How scientific discoveries lead to subsequent technological advances and the resultant social impact

c. The increasing importance of harmonious development of natural science, social science and technology

Evaluation

Evaluation will be based on student participation in group discussion, on examinations, and on evaluations of reports and projects. The required paper will be based on the broad objectives of the course.

PROFESSIONAL EDUCATION

The professional programme of the Regional Colleges of Education is based on the belief that the teacher should have certain very important characteristics, namely; (a) be educated in the subject matter he will teach (b) be professionally educated in order that he may become an effective and intelligent teacher and (c) be educated to function in society both as a citizen and as a professional teacher. It follows that the various parts of the total curriculum are all inter-related and are all equally important, and the staff will operate as a team.

Every effort has been made to build the practical core of professional education on the experiences to be derived from the life of the community and the schools in action.

The guidance programme is planned to focus on career problems and objectives. It is also designed to help the prospective teacher to understand placement possibilities and to help him in placement and adjustment on the job.

In many ways, the field experiences planned for the prospective teacher will be the culmination of the professional programme, providing a testing ground for what he has learnt through the total programme.

The outline of the total instructional programme is shown in Table 7. The specific courses in professional education are shown in Table 8.

SYLLABUS—PROFESSIONAL EDUCATION—GENERAL AND EDUCATIONAL PSYCHOLOGY

Year II/3 Periods / One paper / 100 Marks
Year III/3 Periods / One Paper / 100 Marks

Nature and Role of the Sequence

The first course, *General Psychology*, is designed to be general and non-technical. Practical applications of principles are to be stressed. The second course, *Educational Psychology*, is designed to be a basic element in professional education. This course will stress learning and the foundations of teaching-learning processes.

Teaching Method

In year II the prescribed text as well as the teaching method should be focussed on specific problems. Lectures should be supplemented by discussion and illustrated by practicals. Emphasis should be given to wide reading, some of which may be in the regional language of the student. Children should be observed in normal and stress situations.

In year III emphasis should be placed on the learning process. The work should be integrated with the two courses in special methods since these courses have a time allotment to allow for classroom observations. Joint seminars might well be held.

Content

YEAR II-GENERAL PSYCHOLOGY

Unit 1. Psychology as a science of human behaviour; methods of studying human behaviour—clinical, differential and experimental

Unit 2. Determinants of human behaviour

a. Biological—the nervous system, glandular system, sense organs, heredity and environment, maturation and learning

b. Social—home, school and community

c. Psychological—concept of needs and drives

Unit 3. Nature and development of personality

a. Physical—motor development

b. Social—child in family, school and groups, development of interests and attitudes, social interaction, leadership

c. Intellectual—perceiving, reasoning, thinking imagining, problem solving

d. Emotional—formation of sentiment and character, emotions, concept of mental health, behaviour problems, adjustment

Unit 4. Intelligence and aptitude—their meaning and nature, measurement of intelligence and aptitude, uses and limitations of such tests

Unit 5. The unconscious–conflicts, defence mechanisms, types of behavioural disorders

Note: Experimental work should be provided; a series of 10 experiments should be developed by the instructor. The experiments should be related to the syllabus outlined.

YEAR III-EDUCATIONAL PSYCHOLOGY

Unit 1. Psychology as a discipline

(*a*) The nature of educational psychology

(*b*) The contributions of psychology to teacher education

(*i*) social psychology and mental hygiene as they apply to classroom and school organization, teacher-pupil planning, and human relations

(*ii*) abnormal psychology as it relates to the identification of and guidance of typical students

(*iii*) contributions of educational psychology to teaching practices

Unit 2. Human growth and development

a. Heredity and environment—nature and nurture of growth and development

b. Physiological and biological bases of growth—development, maturation and learning

c. Individual differences and how they affect teaching and learning

d. The nature and nurture of abilities and interests

e. The nature and meaning of intelligence

f. Emotional and social development

Unit 3. The construction and use of tests

a. Common types of tests—written, oral, performance

b. The measurement of abilities, intelligence, interests, achievement

c. Test validity and reliability

d. Elementary statistics as they relate to test construction, test improvement, and grading

Unit 4. The nature of learning

a. Learning, retention, transfer, and application; various theories (trial and error, conditioning and Gestalt)

b. Relevance of school work to adolescent needs

c. Motives and incentives

d. Discipline

e. Research on teacher-learning process: classroom dynamics, workshop method, and problem-solving method

Unit 5. Psychological bases of learning by doing

a. Learning motor skills

b. Integration of theory and practice

Unit 6. Mental health in the school

a. Psychodynamics of human behaviour according to Adler, Freud and Jung
b. Psychological mechanisms and types of mental disorders
c. The role of educational agencies in mental health

Unit 7. Psychological foundations of creativeness

a. Principles of creativeness
b Review of research in creativeness
c. The identification and development of talent broadly defined; academic, artistic, mechanical, athletic, etc.

Unit 8. The application of psychological theories and principles to common school problems.

Samples follow, but the problems dealt with should be selected by each class and instructor.

a. How to develop staff relationships that encourage good communications and cooperation
b. How to deal with problems of student discipline
c. How to provide for individual differences while making maximum group progress
d. How to make the evaluation system organic to the instructional programme
e. How to carry on pupil-teacher planning within a fixed syllabus
f. How to organize a class in order to encourage individual and group creativeness

Evaluation

Internal evaluation should be continuous and use varied methods, drawing upon the principles of psychometrics taught in the sequence. Wherever possible, students should carry out experiments in self-evaluation and in evaluating the work of their classmates.

Evaluation should also be based on reading assignments, student participation in group discussions and performance in identifying psychological problems.

Evaluation in year III should especially stress application of principles.

SYLLABUS—PROFESSIONAL EDUCATION—FOUNDATIONS AND PROBLEMS OF EDUCATION

Year III/ 2 Periods/One Paper/100 Marks
Year IV/ 2 Periods/One Paper/100 Marks

Nature and Role of the Sequence

The objective of this sequence is to enable the student to attempt an answer to questions like these : What is knowledge ? What is philosophy ? What is education ? What education is of most worth ? What are the philosophical, historical, sociological and psychological bases of various educational concepts and practices ? Does education determine the nature of the social order or is the nature of education determined by the social order ? Can education work for peace and international understanding ? What are the limitations of education and philosophy ? What educational policies should India adopt ?

The sequence should enable the student to use all his general and professional knowledge to view the philosophical and sociological problems of education in India as a whole. It should give the student an opportunity to synthesize the knowledge and experience he has gained and also prepare him for gaining further knowlege and experience.

Teaching Method

The units in the first year are designed to give a background to the sequence. The emphasis should be placed on the role of the secondary teacher. Common seminars could be held with closely related courses such as : *Workshop in Teaching, Special Methods and Internship in Teaching,* and the course on *The History of Science and Technology.* Students could make studies of the communities in which they will have their internship in teaching.

The emphasis in the second year should be on educational problems. Attention should be given to the conscious development of a philosophy of education by each student, which would be rooted in the cultural and other values of the Indian way of life.

Content

YEAR III

Unit 1. Philosophy and education

a. Role of philosophy as a discipline
b. Relationship between philosophy and education
c. Different approaches to a philosophy of education—idealism, realism, naturalism, pragmatism and fascist views of education.

Unit 2. Education and the social order

a. Education and economics
b. Education and politics
c. Education and social institutions
d. Education and science
e. Education as an instrument of national policy
f. Education and values

Unit 3. The nature of education and of the educational process

a. The role, aim and function of education
b. Knowledge, character, vocation, citizenship as aims
c. The nature of the educational process
d. International implications
e. Education for democratic living
f. Education and the problem of national integration
g. The Gandhian view of education

Unit 4. Agencies of education

a. The home, the school, the community
b. Official and non-official agencies such as Ministry of Education, National Council of Educational Research and Training, University Grants Commission, teachers organizations, media of mass communication, citizens organizations, libraries.
c. Impact of science and technology on education
d. The community school

Unit 5. Some outstanding educational experiments

a. Nursery Kindergarten, Montessori Project method, Progressive education, Dalton plan, Shantiniketan and Basic Education

b. Role of research and experimentation in education

YEAR IV

Unit 1. Review of background

A quick review of the historical background of Indian education up to 1950

Unit 2. Indian education

The development and problems of Indian education under the Five-Year Plans, education and the Constitution of India, Secondary Education Commission, expansion of educational facilities, the organizational and administrative set-up at various levels, professional and governmental agencies for promoting educational development at various levels

Unit 3. Community school practices

a. Studying the basic characteristics of a community
b. Studying the impact of community development on a community
c. Investigating relations of schools and communities
d. Designing new school-community relationships

Unit 4. Problems of education

a. Discipline and democracy
b. The concept, function and the future of public schools in India
c. The language problem
d. National integration
e. Education for international understanding
f. Literacy in India and the world; fundamental education
g. Educated unemployed
h. Socio-economic status of teachers in India and abroad

Note : These are only suggestive and not exhaustive. Other current problems of education may be added as they arise and as considered significant.

Evaluation

Evaluation should be based on such criteria as the following :

a. Ability to identify social and educational problems
b. Ability to propose possible solutions
c. Ability to participate in planning activities
d. Ability to suggest a role for education and the educational profession in regard to a given educational problem
e. Ability to construct a personal philosophy

Evaluation should consist of reviews of written assignments, participation in seminars, reviews of readings and results of teacher-made tests. A paper will be given at the end of each year.

SYLLABUS—PROFESSIONAL EDUCATION—WORKSHOP IN TEACHING

Year III / 5 Periods / One Paper / 100 Marks

Nature and Purpose of the Course

This course is designed to bring together the applications of theory to the secondary school situation. It will focus the students' attention on the profession of teaching and lay a broad basis for the courses in methods and principles that follow or are taught concurrently.

Teaching Method

Because of its role and content, this course should be assigned to an experienced teacher who would assume responsibility for the course. He will, however, need the help of a number of specialists as indicated by the content including specialists in evaluation psychology, guidance, health, physical education and recreation.

It is expected that the course will be taught as a demonstration in techniques of team teaching, and in pupil-teacher planning.

The course should be planned and integrated with observations of children and classrooms and the work of other professional courses in year III as well as *Health, Physical Education and Recreation.* Observations should be planned jointly with teachers teaching the special methods courses since the time allotment for observing is specifically scheduled in those courses.

The team teaching will require (a) a pre-planned syllabus, (b) statements of objectives and evaluative criteria, (c) continuous cooperative planning and (d) the use of carefully prepared and selected materials of instruction.

Content

Unit 1. Evaluation

a. Review of theory
b. Evaluation—its various uses in the secondary school situation —an investigation based primarily on the Demonstration School
c. Principles of evaluation

d. Elementary statistics and test interpretation
e. Skill development in the use of standardized and external tests
f. Skill development in constructing and using teacher-made tests and using the class as a laboratory

Unit 2. Guidance

a. Review of theory
b. Philosophy and principles of guidance
c. Aims of guidance
d. Evaluating the student (through performance in class and co-curricular activities; anecdotal and cumulative records; autobiographies and guidance essays; sociograms; career reports and observational techniques)
e. Uses and limitations of standardized tests and inventories in guidance
f. Educational and occupational information
g. Group guidance techniques
h. Understanding the role of the counsellor and other specialists
i. Guidance through curricular subjects, books and hobbies
j. Assisting students with educational and vocational planning (explanation of the role of the career master, etc.)
k. Teaching and guiding the exceptional student (gifted, retarded, handicapped)
l. Teacher's role in guidance, job placement and follow-up
m. Principles of parent-teacher participation
n. Guidance—its uses in the secondary school situation—an investigation based primarily on the Demonstration School
o. Skill development in applying guidance techniques in the Demonstration School; analysing data and outlining appropriate teaching-learning situations, counselling techniques and remedial measures

Unit 3. Health and human relations

a. Review of theory
b. Importance of health—an investigation of the problem of health education in the Demonstration School
c. Principles of health, physical education, recreation and human relations, role of the school health service
d. Skill development in planning and directing activities in health, physical education and recreation, healthy and clean environ-

ment, a wholesome diet, remedial measures against communicable diseases, periodic physical examinations, health records.

e. Skill development in contriving teaching-learning situations to bring about better human relations in the social life of the college

f. The role of the teacher in the health programme

This unit is designed to draw the professional implications from the experiences in self-development and study of health problems growing out of the health sequence offered as general education. The objectives of that sequence are germain to this unit and should be used as guides.

Unit 4. Organization and administration

a. Review of theory

b. Investigation of forms of organization in (*i*) the college, (*ii*) the college classes, (*iii*) the Demonstration School, (*iv*) the Demonstration School classes.

c. Principles of school organization and of classroom organization

d. Skill development in organizing a multipurpose school e.g. critique of the Demonstration School organization with construction of alternative plans; well known experimental schools in India

e. Skill development in organizing classes (college physical education classes and Demonstration School classes of all kinds) with special attention given to individualization of instruction and grouping

f. The role of the headmaster and the teacher in organisation and administration, the role of special services in the school

g. Administrative organization of the Union Ministry of Education, State Departments of Education and other private and autonomous educational organizations

Evaluation

Evaluation should be based primarily on performance and paper-and-pencil tests designed to test power in the application of given principles. Suggested test situations :

For the Unit on Evaluation : three selected exercises, such as :

a. Interpreting data from a complicated achievement test

b. Constructing a test for a carefully described unit of instruction —explanation and justification of the test

c. Listing the evaluative criteria to be used in measuring a prescribed course of study designed for skill development

For the Unit on Guidance : three selected exercises, such as :

a. Constructing a guidance programme to accompany a given course or stream of school programme

b. Prescribing the steps to be taken in helping a misplaced student in a multipurpose school

c. Revising a given group guidance syllabus

For the Unit on Health : three selected exercises, such as :

a. Proposing an improvement of some given aspect of the programme of the Demonstration School

b. To outline his role in regard to contributions that the student-teacher can make (*i*) to physical education and recreation programmes, (*ii*) to the improvement of staff relations, and (*iii*) to the administration of the Demonstration School

c. Planning steps to protect the total health of under-privileged children in any selected class in the Demonstration School

For the Unit on Organization : three selected exercises, such as :

a. Proposing a re-organization of a multipurpose school

b. Proposing a plan for decentralizing educational administration at the Centre and in the States

c. Prescribing aims, organization, resources, materials and evaluation for a remedial reading programme of a given group of deficient children of a given class in a multipurpose school

SYLLABUS—PROFESSIONAL EDUCATION—SPECIAL METHODS
(TECHNOLOGY)

Year III / 4 Periods / No Paper / No Marks
Year IV / 2 Periods / One Paper / 100 Marks

Nature and Role of the Sequence

This sequence is to be taught by a technology subject-matter specialist who has also specialized in method. The course for year III will be taught concurrently with *Workshop in Teaching* which will deal with general problems of method and certain specified applications such as evaluation. The course for year IV will be planned in relation to *Foundations and Problems of Education* and *Internship in Teaching.*

Teaching Method

Lecture, discussion, planned observation, and supervised student teaching constitute the principal methods to be employed in this course. Selected observations, and supervised experiences will be used to demonstrate and reinforce the learning of the principles and techniques which are taught. Observations will be in the demonstration school and in neighbouring schools, farms, industries and communities. Students will also plan and carry out simpe instructional activities in group and individual guidance, and teaching short units under supervision. Individual and group criticism will be utilized. Year IV will be taught as a continuation of year III and the method will be essentially the same. However, in year IV the observation and practice will be provided largely in the internship in teaching.

Content

YEAR III

Unit 1. How educational philosophy gives direction to teaching methodology—e.g. how several common philosophies affect teacher practices in common classroom situations

Unit 2. How educational psychology gives direction to teaching methodology

a. Adaptation to individual differences *versus* uniform standards

b. Learning theories *versus* unfounded practice

Unit 3. Planning and preparing lessons
- a. Preparation and use of written instructional materials
- b. Preparation and use of other audio-visual materials

Unit 4. Methods of teaching hand skills
- a. Demonstration
- b. Trial and error
- c. Review of progress and remedial help
- d. Refinement and application

Unit 5. Methods of teaching technical knowledge
- a. The illustrated lecture
- b. Integration of theory and practice
- c. Directed self-study
- d. Discussion
- e. Experimentation and problem-solving

Unit 6. A complete teaching experience

This unit should be individualized and should come near the end of year III
- a. Planning a unit of instruction
- b. Teaching a unit of instruction
- c. Evaluating the unit taught in terms of (a) achievement of learners and (b) student's success as a teacher

YEAR IV

Unit 1. An adequate learning environment
- a. Planning technology facilities and obtaining supplies and equipment
- b. Causes and correction of discipline problems
- c. Class organization and management

Unit 2. Making and improving courses of study and curricula
- a. Techniques for analyzing and organizing content—criteria for selection
- b. Selection of the appropriate teaching-learning procedures
- c. Reviewing and improving courses and programmes in technology

Unit 3. Exercises in the evaluation and improvement of technical instruction
- a. Dual purpose of evaluation—evaluate both pupil progress and quality of instruction

b. Selection or development of evaluation materials
c. Use of self-evaluative techniques

Unit 4. Utilizing resources, observations, and field trips
a. Purposes and evaluation
b. Planning and executing teaching units based on these techniques

Unit 5. Review and study educational research dealing with methodology
a. Review research and study techniques
b. Make applications of research in technical instruction
c. Conduct a pilot study of some teaching-learning process

Unit 6. Preparing for the internship
a. Purposes of the internship
b. Studying communities and their educational problems
c. Studying the selected community
d. Reviewing pertinent syllabi
e. Procedures of the internship

Unit 7. Capitalizing on the internship
a. Reviewing and evaluating the experience
b. Readings in method
c. Further teaching in the Demonstration School if needed

Evaluation

Internal evaluation should be based on short papers dealing with special methods and on power tests dealing with planning and carrying out projects in instruction.

SYLLABUS-PROFESSIONAL EDUCATION-INTERNSHIP IN TEACHING

Year IV / 11 Periods / No Paper / 300 Marks

Nature and Role of the Course

The term "*internship*,"—used more often in the training programmes of certain other professions than in teacher training—refers to an arrangement under which a prospective teacher can acquire his first experience as a teacher in a situation closely resembling that in which he will be working when he enters the profession.

This course is designed to provide each student with a comprehensive experience and will be implemented in a realistic teaching-learning situation in the cooperating schools. To make the total experience similar to actual teaching, students will work full-time in the cooperating schools. A block of about eight weeks time should provide the student ample opportunity to become well-acquainted with the school and community setting and the normal role of a teacher.

Students will be assigned to cooperating schools in two groups, Group A (science students) and Group B (technology students). Group A will begin its internship at about the middle of the college year, continuing for about eight weeks. Group B will go to selected schools for eight weeks immediately after Group A completes its work.

Teaching Method

Actual participation on the part of each student will be the basis of this course. Selection of specific experiences to be provided will be the combined responsibility of the cooperating teacher and headmaster, college personnel and the student teacher.

The greater part of the assistance to the student teacher during internship will come from the cooperating teacher. Experiences are to be planned and evaluated cooperatively by the student teacher and the cooperating teacher. Personnel from the concerned departments of the Regional College will visit the cooperating schools periodically to observe the progress of the student-teacher. Criticism of the performance of the student-teacher should be done by the college personnel, the student teacher, and the cooperating teacher and the headmaster.

The early part of the internship should be devoted to practising the many duties of a teacher, both instructional and non-instructional. A full teaching assignment should be gradually assumed by the student during the final weeks of the course.

Periodic seminars will be held on a weekly or bi-weekly basis in which students from several cooperating schools will meet the staff from the Regional College. Discussions of teaching problems and experiences will be the major purpose of these sessions. Several written assignments will be included in the requirements.

Content

A suggested outline of student experiences during internship applicable to all teaching areas follows :

Unit 1. Overall planning of departmental programme

a. Prepare a plan for observing and understanding a new department in a school, including instructional programme, physical facilities and staffing patterns

b. Review the total instructional programme and the long-range plan with the cooperating teacher

c. Conduct an evaluation of the departmental programme on the basis of recognized criteria, and work out a plan for continued programme development

Unit 2. Planning and teaching units of instruction

a. Become acquainted with students in the department

b. Discuss the teaching programme of the department with the cooperating teacher

c. Observe the cooperating teacher during teaching, discuss the methods used and results obtained

d. Plan and teach a variety of types of lessons, including discussion, demonstration, lecture, etc. Evaluate results with the cooperating teacher and with personnel from the Regional College

e. Plan, construct and use in the class-room several types of evaluative devices

Unit 3. Guidance and counselling

a. Discuss the overall guidance programme of the school with the cooperating teacher

b. Conduct periodic conferences with an assigned group of students

c. Develop a guidance record for some students
d. Develop a comprehensive case study of one student based upon periodic observations, conferences and other available reports
e. Interview school leavers of the department to determine the effectiveness of the programme

Unit 4. Physical Facilities

a. Examine and evaluate the overall physical facilities of the school
b. Examine and evaluate the physical facilities in the department

Unit 5. School and community

a. Examine and evaluate the total instructional programme of the school
b. Examine and evaluate the relationship of the school to the community
c. Examine and evaluate the relationship of the department to the community
d. Observe teachers other than the cooperating teacher
e. Confer with individuals in the community regarding placement of secondary school leavers
f. Participate in co-curricular activities in the school
g. Teach several classes in the school outside the department in which major experience is provided
h. Attend staff meetings

Unit 6. Professional improvement

a. Attend when possible, meetings of professional educational organizations, and evaluate their programmes and impact on education
b. Read and evaluate professional publications
c. Attend inservice education meetings and activities

Evaluation

Evaluation of the course will be based on a cooperative, continuous process, involving the student teacher, cooperating teacher and other personnel of the cooperating school, and personnel from the Regional College. Performance in the classroom should be considered the most important factor in evaluating the student.

THE SCIENCE PROGRAMME

The programme in science is planned as a part of a total programme of teacher education. The purpose is to prepare science teachers for secondary schools where they will be required to teach general science as well as specialized courses in physics, chemistry, or biology. The total programme integrates general education, subject matter content and professional education. The science teacher should know his science, his education and be prepared to live a full life.

Two sequences are provided, one for the biological sciences and another for the physical sciences. These programmes provide for double majors in order to meet the needs of secondary schools. Mathematics is a common element for all science students.

The total instructional programme of the college is shown in Table 7, p. 55. The curricula in both the physical sciences and the biological sciences are shown in Table 9 p. 57.

The tentative syllabi are presented as outlined.

SYLLABUS-SCIENCE-UNIFIED PHYSICAL SCIENCE

Year I / 9 Periods / 2 Papers / 150 Marks
Year II / 9 Periods / 2 Papers / 150 Marks

Nature and Purpose of the Sequence

This sequence is basic and common to all students of science and technology. It is essentially a general education course. The intent is to teach the phenomena of physics and chemistry, geology and astronomy in an integrated manner, in order to avoid repetition and lay a sound basis for more specialized work in science.

Teaching Method

The methods used should include lectures, demonstrations, symposia, and practical work. Guest lecturers should be brought in on occasions.

Content

YEAR I

Unit 1. Atomic theory

Dalton's Theory. Laws of chemical combination and Avogadro's hypothesis. Vapour density and its determination. Molecular weights. Equivalent and atomic weights. Valency—classical concept.

Unit 2. The Periodic System

Classification of elements. Periodic Law. Modern Periodic Table. Transition elements. General description of broad groups of elements and their interrelations, *e.g.* inert gases, alkali metals, alkaline earth metals, common commercial metals, halogens, rare and radio-active elements.

Unit 3. States of matter

a. The gaseous state. Kinetic Theory. Ideal gases. Graham's law of diffusion. Equation of state. Deviation from gas laws, modified equations of state. Laws of corresponding state. Liquification of gases. Specific heats.

b. The liquid state—Vapour pressure. Surface tension. Viscosity. Relationship between physical properties and chemical constitution.

c. The solid state—elementary ideas about crystal structure.

Unit 4. Elements of earth science

a. Origin of earth—earth as a planet

b. Meteorological phenomena

c. Earthquakes and the interior of the earth

d. Land, sea and air. Geological time scale and physical changes such as movements of ancient seas, mountain building, glaciation and erosion

e. Weathering of rocks and soils

f. Geology of India; principles of stratigraphy

g. Study of fossils and evolution

h. Different types of rocks; igneous and metamorphic rocks

i. Sedimentation and sedimentary rocks

j. Common minerals and their origin, standard procedures for identifying minerals

k. Origin and ocurrence of metallic and non-metallic minerals such as coal, oil, iron and uranium and their economic importance. Conservation of such natural resources as soil and water.

Unit 5. Solutions

Solutions in general. Theory of dilute solutions. Osmosis and osmotic pressure. Other colligative properties (elementary treatment).

Unit 6. Colloids

Classification. Preparation. Brownian movement. Catephoresis. Coagulation. Optical properties. Peptization. Protective colloids.

Unit 7. Chemical equilibrium

Reversible and irreversible reactions. Law of Mass action and Le Chatelier's principle and their simple applications.

Unit 8. Catalysis

Elementary treatment including enzymes.

Unit 9. Electrostatics and current electricity

Electric field strength; potential. Ohm's Law, magnetic field, current field interaction. The electron. Cathode rays; e/m measurement; measurement of e; determination of Avogadro's number.

Unit 10. Electro-chemistry

Faraday's Laws of electrolysis. Arrhenius's theory of electrolytic dissociation. Specific, equivalent and molar conductivity. Strong and weak electrolytes. Elementary treatment of the following : degree of dissociation, Ostwald's Dilution Law, solubility product and its application in analytical chemistry. Ionization product of water. Hydrolysis. Neutralization. Hydrogen-ion concentration—(pH). Determination of pH. Buffer solutions. Indicators and their theory.

Unit 11. Elementary optics

Lens aberrations. Lens combination, achromatic combination of prisms and lenses, direct vision spectroscope. Magnifying and resolving power of lenses. Telescopes and microscopes. Binocular vision.

YEAR II

Unit 1. Kinematics

Speed and acceleration—measurement of time and space and errors. Motion with constant speed; instantaneous speed; equation

of motion for constant acceleration. Kinematics of free fall; experiment and theory.

Projectile motion—simple trajectories; Vector algebra. Newton's Laws of motion—first, second and third. Uniform circular motion, centripetal and centrifugal forces.

Unit 2. Astronomy

Elements of Astronomy, Greek and Indian. The Copernican Theory. Kepler's Laws. Newton's Laws of Universal Gravitation—derivation and tests. Value of g, mass of earth and other celestial bodies; shapes of planets, Kater's pendulum effect of latitude and rotation of earth on g; tides.

Unit 3. The conservation principles

Mass. Momentum. Angular momentum. Energy.

Unit 4. Heat

Temperature, measurement of high and low temperatures, specific heat, measurement ; calorific value of fuels. Heat of chemical reactions, elementary thermo-chemistry. Hess's Law.

Unit 5. Thermodynamics

First Law—Joule's and Mayer's work and applications. Second Law—Entropy, direction of heat flow, efficiency of heat engines.

Unit 6. Quantum theory

Quantum Theory. Black body radiations, photo-electric effect, measurement of 'h', spectra—emission, absorption, Balmer series and others. Rutherford's Atomic Model, Scattering of particles, nuclear charge and size. Bohr's Theory, energy levels and spectra, correspondence principle-covalency, coordination covalency. X-rays—measurement of wave length and use in crystal structure. Atomic number and its determination. Matter, waves and indeterminacy (introductory treatment).

Unit 7. Nucleus of the Atom

Radioactivity and isotopes—natural radio-activity, radioactive series, half lives, isotopes, mass spectrography, artificial transmutation of matter. Discovery of the neutron, positron, meson and other fundamental particles. Induced radioactivity. Mass energy equivalence. Exoergic and endoergic reaction. Nuclear fission and fusion. Reactors. Uses of isotopes.

Unit 8. Analytical chemistry

Chemistry of reactions used in qualitative analysis, semi-micro-methods of analysis and spot test.

Principles of volumetric analysis, Determination of equivalent

weights, stand solutions; alkalimetry and acidimetry. Simple red-ox titrations and the use of internal indicators.

Unit 9. Chemistry in industry (for candidates offering Physical Sciences as major)

Na, Au, Pb, Fe or others

Fixation of Nitrogen

Chemical principles involved in the manufacture of sodium carbonate, caustic soda, cement, glass, superphosphate, artificial manures, sulphuric acid,

OR

Chemistry of carbon compounds* (for candidates offering Biological Sciences as major)

Classification, hydrocarbons and their halogen derivatives.

Alcohols, aldehydes and ketones.

Fatty acids and their derivatives, amines.

Carbohydrates—mono- di- and poly-saccharides. Amino acids, polypeptides and proteins, enzymes, virus. Naturally occurring nitrogen compounds.

Unit 10. Bio-chemistry : The nature of bio-chemistry new developments in bio-chemistry

PRACTICAL WORK

1. Preparation and properties of the following :
   a. Oxygen, nitrogen, hydrogen
   b. Chlorine, bromine, iodine
   c. Ammonia, hydrochloric aid, nitric acid
   d. Oxides of nitrogen
   e. Ozone and hydrogen peroxide
   f. Phosphine
   g. Silver nitrate from silver coin
   h. Ferrous sulphate or Mohr's salt from Kipp's sludge
2. Qualitative analysis of inorganic mixtures containing two basic (not belonging to the same group) and two non-interfering acid radicals from the following : Ag, Hg, Pb, Cu, Bi, Cd, As, Sb, Sn, Al, Fe, Cr, Zn, Mn, Ni, Co, Ca, Sr, Ba, Mg and NH_4, CO_3, Cl, Br, I, SO_4, SO_3,S, NO_2, NO_3, C_2O_4, PO_4, CH_3 COO. (Combinations of NO_2 and NO_3,S, SO_3 and SO_4, and Cl, Br and I, etc., not to be given).
3. Verification of laws of chemical combinations.

*To be dealt with in such a way as to familiarize the biology group students with basic ideas of organic chemistry.

4. Equivalent weights of Mg, Cu, Ag and halogens.
5. Vapour density--Victor Meyer's and Duma's methods.
6. Verification of gas laws.
7. Verification of Ohm's Law—determination of specific resistance.
8. Conversion of a Galvanomter into Voltmeter and Ammeter.
9. Verification of Faraday's Laws of electrolysis and determination of electro-chemical equivalent—simple experiment of copper/nickel plating.
10. Radii of curvature of surfaces of a lens by spherometer.
11. Focal length of a convex mirror and concave lens, using a telescope and beam compass.
12. Refractive index of a liquid using a convex lens, a plane mirror and a spherometer.
13. Construction of microscope and telescope.
14. Measurement of osmotic pressure and determination of molecular weights of solutes therefrom.
15. Preparation of colloidal solutions and study of their cataphoretic, coagulative and optical properties.
16. Determination of pH by indicator method.

YEAR II-PRACTICAL WORK

1. Verification of Newton's law of free fall and Newton's laws of motion.
2. Measurement of centripetal and centrifugal forces.
3. Simple astronomical experiments-- use of telescope.
4. Determination of the value of g by simple and compound pendulum.
5. Conservation of momentum and energy— ballistic pendulum.
6. Mechanical equivalent of heat.
7. Use of platinum resistance thermometer.
8. Heat of solution and neutralization— use of Bomb Calorimeter.
9. Use of spectrometer— determination of u— measurement of wave length.
10. Use of photo-electric cell—relation between intensity of light and current produced. Comparison of illuminating powers.
11. Determination of half life of a radioactive element.
12. Semi-micro qualitative analysis of a mixture containing 5 radicals from the list given in the first-year work. (Basic radicals from the group and acid radicals the tests of which interfere may be included. Insoluble salts to be avoided).

13. Volumetric analysis—Acidimetry and alkalimetry. Mixtures of carbonate and bicarbonate. Red-ox titrations using oxalic acid, ferrous sulphate, sodium thiosulphate, potassium permanganate, potassium dichromate and iodine. Volumetric determination of copper sulphate.
14. Gravimetric estimation of silver as chloride and barium as sulphate.

Evaluation

Two papers should be required at the end of each year, one theory and one practice.

SYLLABUS—SCIENCE—UNIFIED SEQUENCE IN BIOLOGICAL SCIENCE

Year I / 9 Periods / One Paper / 150 Marks
Year II / 9 Periods / One Paper / 150 Marks

Nature and Purpose of the Sequence

This sequence is basic for the biological sciences group and ancillary for the physical sciences group and the physics and mathematics group. The content should be uniform, however, and should include a good balance of zoology, botany, micro-biology, human physiology, health and hygiene.

Teaching

The principal methods used should be lectures, demonstrations, seminars and practicals. Guest lecturers and field trips should be utilized.

Content

YEAR I

Unit 1. The Living World

Origin of life—the first cells, properties and types of early cells.

Unit 2. Living Organism

Functional characteristics, structural characteristics.

Unit 3. Organisation of Living Beings

Protoplasm and cells, chemical composition of protoplasm, inorganic and organic components, properties of protoplasm, colloidal state; Brownian movement; sol-gel transformations—protoplasmic membranes. Structure of protoplasm, nucleus and cytoplasm, cell inclusions; cell wall; cell division; tissues.

Unit 4. Kinds of Organisms

Plants and animals.

Unit 5. Thallophyta

Structure; methods of classification. Algae; general account; *Chlamydomonas*; *Spirogyra*; *Oedogonium*; *Oscillatoria.*

Protozoa; general account; *Mastigophora*; *Trypanosoma*; *Sarcodina*; *Amoeba*; *Arcalla*; *Radiolaria*; *Ciliophora*; *Sporozoa*; *Plasmodium*·

Paramecium; *Vorticella.*

Fungi; general account; *Rhizopus*, yeast, *Puccinia*, *Agaricus*. Bacteria.

Unit 6. Higher Plants (Metaphyta)

An understanding of the increasing complexity of plant organization as illustrated by *Riccia*, moss, fern, *Pinus*, and one or two typical angiosperms, one monocotyledon and one dicotyledon.

Internal structure of vascular plants; stems, roots and leaves.

Floral patterns : Pollination, structure and dispersal of fruits and seeds.

Unit 7. Metazoa

Advanced animals : animal characteristics; animal-structure and organization as illustrated by non-chordates; hydra, jellyfish, corals; acoelomates—platy-helminthes, liver-fluke and tape-worm. Nematodes : *Ascaris*; mollusca; fresh water mussel, snail; Annelida; earthworm, *Neries*; Arthropoda; prawn, housefly, cockroach, mosquito.

Echinodermata; starfish.

Enterocoelomates.

Chordates : some diagnostic features : *Balanoglossus*, *Amphioxus*, bony fish, frog, lizard, bird (Pigeon), mammals, (rabbit or rat).

Unit 8. Species, community and environment

The species : variations ; the society :—insect societies, vertebrate societies; the community, plant and animal communities in different environments, cycles and balances; control factors. Symbiosis. Parasitism. The communal habitats, oceanic habitat. The surface waters. The deep waters. The fresh water habitat. The terrestrial habitat. The global environment-geographical cycles.

Unit 9. Inter-relationships between living organims.

Geographical distribution of plants and animals and migration.

YEAR II

Unit 1. Enzymes

In plants and animals, their characteristics, modes of action.

Unit 2. Autotrophic Nutrition

Autotrophic patterns: The soil, its nature, the inorganic nutrients, absorption.

Transport of water and mineral salts and food in plants.

Photosynthesis : chloroplasts and chlorophyll; mechanism of CO fixation; the end product.

Unit 3. Heterotrophic Nutrition

Heterotrophic patterns : ingestion and digestion; ingestion, hunger, digestion, absorption and egestion. The transport pathways, functions of liver.

Unit 4. Cellular Metabolism

a. Respiration; pattern of respiration, oxidation, the fuels, energy gain, energy transfer, hydrogen transfer, anaerobic respiration, fuel combustion, carbohydrate breakdown.

b. Energy utilization: physical uses of energy, production of heat, bioluminiscence, bioelectricity, chemical uses of energy, protein synthesis.

c. Patterns of breathing : the breathing system, the breathing process, control of breathing, gas transport, the vehicle.

Unit 5. Body Fluids

Blood and lymph; blood cells, circulation, excretion.

Unit 6. Nerve Co-ordination

The neural path-ways, reflex arcs. Nerve impulses, the neural receptors. Dispersed receptors, taste and smell (the tongue and the nose), the eye, the ear and the balance. The neural centres.

Unit 7. Reproduction

a. The patterns of reproduction, molecular and cellular reproduction, mitosis.

b. Organismic reproduction patterns, sexuality, sex types, meiosis.

c. Embryo in monocotyledon and dicotyledon. Seed and germination.

d. Embryo in the animals.

Unit 8. Heredity

a. Chromosomes: genes and traits. Mendelian inheritance and non-mendelian inheritance.

b. Cellular controls : genes, vitamins and hormones. Hormones in animals. The principal endocrines.

Unit 9. Mechanism of Evolution

Early notions : Lamarck, Darwin and Wallace, De Vries. Forces of evolution, the genetic basis, nature of evolution, mutation and speciation. Characteristics of evolution, adaptive radiation, extinction, replacement. Convergence and divergence, opportunities.

Unit 10. Course of Evolution

Geologic time table; the evolution of man.

Unit 11. Plants and animals in relations to man

Evaluation

Two papers should be offered at the end of each year, one theory and one practical.

PRACTICAL WORK

1. Examination of types of simple cells of both plants and animals; parts of cell and cell contents. Mitosis in plant and animal cells. Simple tissues of plants, structure of stem, leaves and roots.
   Simple animal tissues like bone and skin, and muscle fibres. Blood smear of frog.
2. Students should prepare, mount and stain types of plants mentioned under units 5, 6 and 7 and identify.
   Dissection with a simple microscope of the floral parts of some types of flowers to bring out their structure and adaptations to pollination. Types of fruits and seeds.
3. Students should dissect and make simple preparation for study under the microscope of :
   earthworm, cockroach, freshwater mussel, frog, lizard, pigeon and rat.
   Dissection of nerves are expected only in case of earthworm, cockroach and frog. Only external characters in prawn, *Pila* and bony fish.
4. The following simple experiments in plant physiology to be set up and studied.
   (*i*) Osmosis (Thistle funnel experiment)
   (*ii*) Respiration (Ganong's respiroscope, anaerobic respiration)
   (*iii*) Photosynthesis—(a) Evolution of O_2 (b) Light-screen experiment.
   (*iv*) Transpiration—Ganong's Potometer.
   (*v*) Tropisms—Due to gravity (Klinostat), water and light
   (*vi*) Growth—Simple auxonometer.
5. Simple muscle twitch in frog.
6. Germination of seeds. Epigeal, hypogeal.
7. Study of chick embryo and pig or sheep embryo.

SYLLABUS--SCIENCE--MATHEMATICS (ANCILLARY)

Year I / 5 Periods / One Paper / 100 Marks
Year II / 3 Periods / One Paper / 75 Marks

Nature and Purpose of the Sequence

This sequence is designed to be ancillary to the students who take Biological Sciences as major.

Teaching Method

The emphasis should be put on the comprehension of the various concepts and techniques. Unnecessary drill should be avoided. Algebra and Geometry should precede Trigonometry and Calculus. Lectures, discussions and demonstration should be used. Guest lectures should be utilized to bring in the latest developments in mathematics.

Content

Unit 1. Algebra

Natural numbers. The commutative, associative and distributive properties of their addition and multiplication (as in chapter I, article 1 of *What is Mathematics* by Courant and Robbins). Integers, definition of their addition, multiplication and subtraction. Rational numbers. Definition of the four fundamental operations on them. Verification of the commutative, associative and distributive properties of their addition and multiplication (as in chapter III, article 1 and 2 of *What is Mathematics*). Representation of rational numbers by points on a line. Statement that rational points do not fill the line. Introduction of irrationals to fill the gaps. Four fundamental operations on reals defined with the help of geometry. Statement of their associative, commutative and distributive properties. Statements that if $a \phi U$, $1/a$ exists. Cancellation law.

Algebraic expressions containing letters standing for fixed numbers only. Their simplification by collecting like terms. The four fundamental operations on them. Brackets. Simple formulae like $(a \pm b)^2$, $(a \pm b)^3$, $(a+b)(a-b)$, $(a+b)(a^2-ab+b^2)$, $(a-b)(a^2+ab+b^2)$. Factors. Indices. Surds. Ratio and proportion.

Polynomials. Values of polynomials. Substitution. Definition of their addition and multiplication. Statement that these operations have the properties of corresponding operations on algebraic expressions containing only those letters that stand for fixed numbers. Statement that if, f(x, y.....)g, (y, t..... ...)=h(x, y, t, ...) are polynomials such that f(x, y, t .....)+ g(x, y, t .....) then relation is true after substitutions also. Similar statement for multiplication. Statement that the algebra established earlier extends to polynomials also.

Polynomials, identities and equations. Simple linear equations. Problems solved by equations. Elimination. Factorization. Quadratic equations.

Imaginary and complex numbers. Four fundamental operations on them and their basic properties. Statement that for arithmetical operations complex numbers behave like real numbers. Solution of quadratic equations.

Summation of finite arithmetic and geometric series. Simple permutations and combinations. Statement of the Binomial theorem for positive integral index.

Unit 2. Geometry (Euclidean and Analytical)

Remarks about the method of proof. Abstraction of geometrical objects from nature. Points and lines. Postulate of equality. Postulates of incidence. Theorems on intersection of two lines and existence of at least three lines. Postulates of betweenness, definition of a line, segment, triangle, ray, angle, types of angles. Theorems about angles, segments. Postulates of congruence of segments. Comparisons of segments, measurements and length. Archimedes, existence and three part postulates of angles. Completeness of postulate, congruence of angles. Addition and subtraction of angles. Right angles. Types of triangles. Congruence of triangles. Side-angle, side-postulate. Theorems on congruence of triangles. Theorems on isosceles triangles. Inequalities between angles and sides of a triangle. Parallel lines. Parallel postulate. Theorems on parallel lines. Sum of the angles of a triangle. Polygons. Parallelograms. Similarity. Theorems on similar triangles. Pythagoras theorem.

Area of rectangle, triangle, polygon. Theorems on areas of parallelograms and triangles.

Circle. Circumscribed and inscribed circles. Tangents to a circle. Perimeter and areas of circle. Theorems on areas and angles subtended by them. Area of a circle. Loci.

Concurrent lines associated with a triangle. Incentre, orthocentre, circumcentre of a triangle.

Space objects. Postulates for space points and planes. Incidence theorems. Perpendicular lines and planes. Volumes of simple bodies.

Introduction to analytical geometry. Coordinates. Distance. Equation of a line and a circle.

Unit 3. Trigonometry

Sexagesimal and circular units of angular measurements; trigonometrical ratios and the simple relations connecting them; relation between trigonometrical ratios of angles differing by multiples of right angles; addition and subtraction formulae ; multiple and sub-multiple angles; general expression of simple trigonometrical equations; the relations between the sides and angles of a triangle; logarithms, solutions of triangles and simple cases of heights and distances; radii of the circumscribed, inscribed and described circles of triangles, area of regular polygon and of a circle; graphs of simple trigonometrical functions.

Unit 4. Elements of calculus

Intuitive idea of function and limit. Derivative. Derivatives of simple functions. Interpretation of derivative as slope of tangent and rate of change. Simple treatment of maxima and minima.

Indefinite integrals of simple functions.

Intuitive idea of definite integral as limit of a sum, and connection between definite and indefinite integrals (*i.e.*, statement of fundamental theorem without specifying conditions for validity).

REFERENCES

1. Brumfiel, Eicholy and Shanks, Addison-Wesley, Reading, (USA) 1962, *Geometry*.

2. Eawes and Robinson, Addison-Wesley, 1957, *An Introduction to Euclidean Geometry*

Evaluation

Students will be examined at the end of each year.

SYLLABUS—SCIENCE—MATHEMATICS (MINOR)

Year I / 5 Periods / One Paper / 100 Marks
Year II / 4 Periods / One Paper / 100 Marks

Nature and Purpose of the Sequence

This sequence is designed as a minor for three groups of students, namely, those who will in their last two years specialize in (a) Technology, (b) Physics and Mathematics and (c) Physics and Chemistry. Thus the content selected is very basic in nature.

Teaching Method

Care should be given at this level of development to the understanding of mathematics as an instrument and a fundamental language.

Content

Unit 1. Algebra

Intuitive ideas of the development of numbers starting from natural numbers and going on to real and complex numbers (no Dedekind Sections; up to real numbers. Chapter I of *Elementary Calculus* Part I by Masani, Patel and Patil is recommended. For complex numbers pp. 91-95 of *Principles of Mathematics* by Allendorfer and Oakley, McGraw Hill, 1953, is recommended.) Simple cases of permutations and combinations. Binomial Theorem with positive integral index. Statements of the Binomial Theorem for negative and fractional indices. Polynomials and polynomial equations. Statement of the fundamental Theorem of Algebra. Relation between the roots and co-efficients of algebraic equations. Simple symmetric functions of the roots. Elementary properties of determinants and their application to solution of simultaneous linear equations. Multiplication of determinants of order three.

Unit 2. Analytical Plane Geometry

Cartesian and polar co-ordinates. Transformation of axes. Straight line. Pair of straight lines. Circle, co-axial and orthogonal circles. Parabola, ellipse and hyperbola (simple properties, tangents, normals, poles and polars.)

Unit 3. Calculus

Real numbers and their correspondence with points on a line. Functions, their domains and ranges. Sequences, intuitive ideas of velocity, tangent and area. Limits and continuity. Derivative. Interpretation of derivative in Geometry and Mechanics. Derivatives of simple functions. Derivatives of functions and implicit functions. Tangents and normals. Simple cases of maxima and minima. Application of derivative to Mechanics and Economics. Successive differentiation. Leibnit Rule.

Definite integral as a sum and an area. Indefinite integral. Geometrical proof of the fundamental theorem of integral calculus. Indefinite integrals of standard functions. Methods of substitution, parts and partial fractions. Simple reduction formulae. Areas and volumes. Simple differential equations of first and second orders.

(Scope of calculus is roughly that of *Elementary Calculus*, Parts I and II by Masani, Patel and Patil, Popular Book Depot, Bombay).

Evaluation

A paper will be offered at the end of each year.

SYLLABUS—SCIENCE—PHYSIOLOGY AND HYGIENE

Year II / 2 Periods / One Paper / 50 Marks

Nature and Purpose of the Course

The course is designed to give biology teachers the basic preparation in human physiology and hygiene. It is an ancillary course for the Biological Sciences Group.

Teaching Method

The course should be constantly related to the courses in health, physical education and recreation. Theory and practice should both be covered.

Content

Unit 1. Cell

Cell permeability, diffusion, osmosis.

Unit 2. Blood

Composition and functions, red blood corpuscles, haemoglobin, anaemia, blood groups, blood transfusion. Leucocytes : origin, function and fate; blood platelets, clotting of blood, blood forming organs, factors in blood formation.

Unit 3. Circulation of blood

Structure and working of heart, heart muscles and regulation of heart beat, pulse, velocity of blood—blood pressure, arteries, capillaries and veins.

Unit 4. Tissue fluid

Formation, circulation and functions – lymphatic vessels and glands.

Unit 5. Urinary system

Structure and functions of kidney, acid regulations.

Unit 6. Skin

Structure, function and thermo-regulation.

Unit 7. Respiration

Respiratory mechanism, regulation, transport of gases in the body.

Unit 8. Digestion

Alimentary canal and digestive glands, enzymes, absorption and assimilation, essential food factors, vitamins, balanced diet.

Unit 9. Nervous system

Brain and central nervous system, reflex action.

Unit 10. Sense organs

Eyes, ear, nose, tongue and skin.

Unit 11. Neuro-muscular system

Muscular contractions, work and fatigue.

Unit 12. Endocrine organs

Thyroid, pituitary and adrenals—their secretions and functions.

Unit 13. Reproduction

Gonads, ovary, teste-ovum and sperm, fertilization development of embryo and parturition.

Unit 14. Personal hygiene

Promotion of health, habits of healthy living.

Unit 15. Community hygiene

Public health and sanitation, housing, air and ventilation, heat and light,water, drainage, refuge disposal, control of infectious diseases.

Unit 16. First-aid methods

Evaluation

Evaluation should deal with both theory and practice and should be quite specific.

SYLLABUS—SCIENCE—WORKSHOP PRACTICE FOR SCIENCE STUDENTS

Year I / 2 Periods / No Paper / 25 Marks
Year II/ 2 Periods / No Paper / 25 Marks

Nature and Purpose of the Sequence

The purpose of this sequence is to develop in science teachers (a) attitudes favourable to the manipulation and use of materials and tools and (b) knowledge and skills in planning, repairing and constructing scientific apparatuses of various kinds.

Teaching Method

The course will be planned primarily as a sequence of experiences with various tools and media. Following the first two years of this work, the science students will apply the skills and knowledge so gained to specific problems in the construction of equipment and improvised aids and apparatuses.

Students will work in various technical laboratories and in the workshop in the science department with tools and materials. A series of basic projects will be required. The teaching-learning process will involve demonstrations and lectures by the teacher and manipulative shop activities by the students. Simple projects of a scientific nature will be constructed in the second year.

Content

Unit 1. Carpentry

Cutting, measuring, planning, nailing, chiselling, rounding, drilling, fret-work, filing, wood-turning—between centres and face plate, using brasives, joining and finishing.

Unit 2. Glass Blowing

Cutting, smoothing and rounding edges, bending, simple blow and draw forming, joining, grinding, etching.

Unit 3. Turning

Straight turning, facing, taper-turning, screw-thread cutting, cutter tool grinding.

Unit 4. Bench Metal

Layout, sawing, cold chiselling, filing, tap and die, polishing.

Unit 5. Sheet Metal

Layout and development, cutting, filing, drilling, folding, raising, annealing, joining, seaming, rivetting, soft soldering, etching.

Unit 6. Electrical

Soldering and connecting, splicing and joining, home circuitry, motor and generator winding, resistance making, electroplating, anodising.

Unit 7. Hot Metals

Joining by hard soldering and brazing, bending, simple shape forging.

Evaluation

Internal evaluation of this course will be based on the objectives and on student progress as judged by the extent to which a favourable attitude is attained and by actual performance in specific skills.

SYLLABUS—SCIENCE—CHEMISTRY (MAJOR)

Year III / 6 Periods / 2 Papers / 100 Marks
Year IV / 9 Periods / 3 Papers / 300 Marks

Nature and Purpose of the Sequence

This sequence is designed for the students majoring in chemistry. Its purpose is to provide the necessary specialization for a teacher of chemistry. The fourth year course should be taught in correlation with the student field experiences.

Teaching Method

The subject should include the latest research in chemistry. The methods used should be principally lectures, discussions, demonstrations and practical work. Guest lectures and educational tours should be utilized.

Content

YEAR III

Organic Chemistry

The growth and scope of organic chemistry. Purification of organic solids and liquids.

Analysis of organic compounds : qualitative tests and quantitative estimation of carbon, hydrogen, nitrogen, halogens and sulphur.

Constitution and classification : linking of carbon atoms, classification of organic compounds, homologous series. Nomenclature.

Aliphatic hydrocarbons : alkanes up to and including four carbon atoms. Isomerism. Petroleum industry. Unsaturated hydrocarbons. Alkanes and alkynes up to four carbon atoms. Halogen derivatives of alkanes : methyl and ethyl halides. Reactions of alkyl halides. Dihalogen derivatives (ethylene and ethylidene derivatives). Trihalogen derivatives of methane. Carbon tetrachloride.

Alcohols : Preparation, manufacture and properties of alcohols. Constitution of alcohols. Primary, secondary and tertiary alcohols (up to four carbon atoms only). Fermentation.

Ethers : Preparation, properties and constitution of ethers. Metamar Motamarism. Diethyl ether.

Aldehydes and ketones : Preparation, properties and constitution of aldehyde, chloral, acetone. Condensation and polymerization.

Fatty acids : Preparation, properties and constitution of fatty acids. Formic acid, acetic acid. Vinegar. Propionic acid, butyric acid.

Derivatives of fatty acids : Acid chlorides, preparation of acetyl chloride. Acid anhydrides, preparation of acetic anhydride. Amides, preparation of acetamide. Esters, preparation of ethyl acetate. Esters of organic and inorganic acids. Hydrolysis of esters. Elementary ideas of oils, fats and waxes.

Amines : Primary, secondary and tertiary amines. Quarernary ammonium compounds.

Cyanogen derivatives : Cyanogen, hydrocyanic acid. Nitrites and isonitriles.

Organo-metallic compounds : Compounds containing magnesium and their applications.

Derivatives of unsaturated hydrocarbons : Allyl derivatives. Acrolein acrylic acid.

Polyhydric alcohols : Ethylene glycol. Ethylene oxide. Glycerol and its structure. Glycerol trinitrate.

Dibasic and tribasic acids : Preparation and properties of oxalic acid, malonic acid, succinic acids and citric acid including their structures.

Stereochemistry : Optical and geometrical isomerism. Isomerism of lactic, tartaric, maleic and fumaric acids. Their preparation, properties and constitution. Resolution of tartaric acids. Simple synthetic uses of malonic and acetoacetic esters.

Carbonic acid derivatives : Carbonyl chloride, urea.

Carbohydrates : Nomenclature. Glucose, fructose and their structures. Properties and manufacture of sucrose, starch and cellulose, nitrocellulose.

Aromatic hydrocarbons : Kokule's theory and constitution of benzene (excluding electronic structures). Aromatic properties. Coal-tar distillation. Benzene, toluene and xylenes, their properties and reactions. Friedel and Craft's reaction, Fitting's reaction. Korner's absolute method of orientation.

Aromatic halogen derivatives : Monohalogenated derivatives chlorobenzene, bromobenzene, iodobenzene. Benzyl chloride, benzal chloride, —benzotrichloride and their properties.

Aromatic nitro compounds : Nitrobenzene and trinitrotoluene and their preparation, properties.

Aromatic amines : Preparation and properties of aniline, methylaniline, dimethylaniline, toluidines, benzylamine and sulphanilic acid.

Diazo compounds : Their preparation and properties (omitting constitution). Preparation and properties of phenylhydrazine and methyl orange.

Aromatic sulphonic acids : Benzene sulphonic acid.

Phenols : Preparation and properties of phenol. Mononitrophenols, picric acid. Anisole.

Aromatics, alcohols, aldehydes and ketones : Benzyl alcohol, benzaldehyde, acetophenone, benzophenone.

Phenolic aldehydes : Salicylaldehyde. Reimer-Tiemann reaction.

Aromatic acids and their derivatives: Benzoic acid, benzoic anhydride benzamide, benzoic esters. Phenylacetic acid. Cinnamic acid. Salicylic acid. Acetylsalicylic acid. Formation and simple properties of diphenylmethane and triphenylmethane.

Naphthalene and its simple derivatives. Pyridine and its simple derivatives.

YEAR IV

Molecular structure—Parachore, dipole moment, infra-red and Raman spectra. Bond links and bond angles and bonds.

Chemical equilibrium and kinetics—order of reaction and its determination. Temperature coefficient.

Solutions—study in general.

Dilute solutions—lowering vapour pressure, depression of freezing point and elevation of boiling point. Determination of molecular weights of solutes. Abnormal molecular weights and vant Hoff's 'i'. Partition coefficient and principles of solvent extraction.

Electro-chemistry—Measurement of conductivity of solutions. Transport numbers. Kohlraushe's law. Detailed study of Ostwald's dilution law and its application. Solubility product.

Abnormality of strong electrolytes. Strength of acids and bases and their determination. E.M.F. of concentration cells and their simple uses.

Systematic study of groups—zero to eight, from the point of view of periodic classification , with a detailed study of the following and their compounds:

Elements : Inert gases. Lithium. Copper. Silver. Gold. Beryllium. Magnesium. Zinc. Cadmium. Mercury. Radium. Boron. Aluminium. Silicon. Titanium. Tin. Lead. Phosphorus. Arsenic. Antimony. Bismuth. Sulphur. Chromium. Uranium. Halogens. Manganese. Iron. Cobalt. Nickel. Platinum.

Compounds : hydrides, halides, oxides and oxyacids of the nonmetals mentioned above ; hydrides, halides, oxides, hydroxides, sulphides, sulphates, nitrates and carbonates of the metals mentioned above. (Simple valency bond structures of oxides and oxyacids and electronic structures of simple compounds are also included.)

YEAR III-PRACTICAL WORK

1. Systematic identification of the following organic compounds, including the determination of their boiling or melting points, detection of elements, application of tests characteristic of groups contained and of compounds themselves and preparation of at least one solid derivative in a pure condition : benzene, toluene, naphthalene, methanol, ethanol, butanol, benzyl alcohol, ethylene glycol, glycerol, phenol, a-naphthol, b-naphthol, resorcinol, pyrogallol, o-cresol, m-cresol, p-cresol, hydroquinone, acetaldehyde, benzaldehyde, chloral hydrate, acetone, acetophenone, benzophenone, formic acid, acetic acid, oxalic acid, succinic acid, citric acid, tartaric acid, benzoic acid, salicylic acid, phthalic acid, cinnamic acid, ethyl acetate, ethyl oxalate, ethyl benzoate, methyl oxalate, methyl salicylate, phenyl benzoate, glucose, sucrose, starch, aniline, o-toluidine, p-toluidine, d-naphthylamine, b-naphthylamine, diphenylamine, dimethylaniline, urea, acetamide, benzamide, acetanilide, nitrobenzene, m-dinitrobenzene, p-nitrotoluene, d-nitronaphthalene, o-nitrophenol, p-nitrophenol, choloroform, carbon tetrachloride, iodoform, chlorobenzene, bromobenzene, p-dicholorobenzene and p-dibromobenzene.

2. Qualitative analysis of inorganic mixture (five radicals) including insolubles.

YEAR IV-PRACTICAL WORK

1. Determination of Parachore and Dipole Moments of liquids.
2. Determination of the order of simple reactions.
3. Cryoscopic and ebullioscopic methods of determination of molecular weights.
4. Measurement of conductivity of solutions methods of degree of dissociation.
5. Dissociation constant of acetic aid.
6. Solubility product of silver chloride.
7. Volumetric analysis—red oxide and precipitation titration.
8. Gravimetric estimation of copper, lead, zinc, iron, chromium and magnesium.

Evaluation

Students should offer one theory paper in Chemistry at the end of year III and two theory papers at the end of year IV in addition to practicals.

SYLLABUS—SCIENCE—PHYSICS MAJOR

Year III / 6 Periods / One Paper/100 Marks
Year IV / 9 Periods / Two Papers/300 Marks

Nature and Purpose of the Sequence

This sequence is designed to meet the needs of a teacher of physics. The fourth year course should be taught in close relationship with the course *Internship in Teaching*.

Teaching Method

Lectures, Seminars, discussions and practicals should be utilized as well as guest lecturers and educational tours.

Content

YEAR III

Unit 1. Properties of matter

Units and dimensional equations.

Simple harmonic motion—characteristics, analytical expression. Composition of two simple harmonic motions in the same and perpendicular directions having the same period; equation of a simple harmonic wave. Lissajou's figures, methods of obtaining them. Rotational motion, gyroscope.

Rotation of a rigid body about a fixed axis, moment of inertia, law of parallel and perpendicular axes, moment of inertia of bodies of regular shape (rectangular bar, cylinder, sphere).

Elasticity, Young's modulus, compressibility, rigidity, Poisson's ratio, measurement of elastic constants. Bending of bars.

Viscosity of liquids, Poisoiulle's law and experimental determination of co-efficient of viscosity. Viscosity of gases, Bernoulli's theorem and its application.

Surface tension, angle of contact, force between two plates due to a thin film of liquid between them, measurement of surface tension, variation of surface tension with pressure. Critical temperature.

Unit 2. Sound

Wave motion, equation of plane progressive wave, velocity of wave motion, effect of change of temperature, pressure and humidity on velocity, Doppler's effect, sound ranging.

Vibrations of strings, sonometer, superposition of vibrations, interference of sound beats.

Acoustics of buildings, reverberation.

Elementary ideas of ultrasonics, ultrasonic generators, velocity of ultrasonic waves in gases and liquids. Sound barrier.

Unit 3. Heat

Gas thermometers, resistance thermometers, thermoelectric thermometers; measurement of high and low temperature pyrometers, Beckman's thermometer.

Convection, conduction and radiation of heat. Searle's method for measuring conductivity of metals, radiation, Kirchoff's law, Stefan Boltzman's law, Plank's law.

Radiation pyrometry, optical pyrometers; measurement of sun's temperature.

Unit 4. Optics

Spectra—emission and absorption in the visible, ultra-violet and infra-red. Zeeman effect, Raman effect.

Velocity of light, wave theory of light.

Interference, biprism, Newton's rings, colours of thin films, interferometers (one).

Diffraction at a straight edge, slit and circular aperture, plane transmission grating.

Polarisation, Nicol prism, polarimeter.

YEAR IV

Unit 1. Magnetism

Line and tubes of induction, magnetic shielding, susceptibility and permeability of materials, hysteresis, hysteresis loss, diamagnetism, ferromagnetism and paramagnetism. Earth's magnetism.

Unit 2. Electricity

Laws of electrostatics, capacitance and energy of a charged condenser, specific inductive capacity. Coulomb's laws in dielectrics, Gauss theorem and its application, attracted disc electrometer, quadrant electrometer.

Magnetic field of currents—Ampere's theorem, equivalent of magnetic shell, magnetic field of a linear current, and circular current, Helmholtz galvanometer, moving coil and moving needle type galvanometers, their sensitivity, ballistic galvanometers. Magnetic field and induction in a solenoid. Force between conductors carrying currents.

Distribution of a steady current in a net work—Kirchoff's law. Carey Foster bridge, variation of resistance with temperature. Callender and Griffith's bridge.

Electromotive force, contact potential, electrode potential, internal resistance of a cell and its measurement, standard cell, thermodynamics of a reversible cell.

Measurement of absolute capacity of a condenser, comparison of electromagnetic and electrostatic units of capacity.

Seebeck's effect, Peltier effect, difference between Peltier and Joule's heating effect, Thomson effect, thermodynamics of thermoelectric circuits, thermoelectric power, pyrometer and thermopile.

Faraday's experiments on electro-magnetic induction, induced E.M.F. Focault's currents, coupling and flux, coefficient of induction, growth and decay of induced current, self and mutual inductance.

Rotating coil and motor effect of induced currents through a circuit containing inductance and resistance; E.M.F. in a circuit with inductance resistance and capacitance, impedance, reactance, R.M.S. value of E.M.F. and current, power in A.C. circuits; choke, transformer, energy loss, transmission of power; A.C. and D.C. generators, distribution system, shunt, series and compound wound generators.

Unit 3. Modern Physics

Electronics—series and parallel circuits, resonance, tuning, electromagnetic waves, crystal rectification, diode and triode, amplification, radio frequency and audio frequency, modulation, simple ideas of broadcasting and reception, ionosphere.

Elementary principles of television, radar and telemetry.

X-rays, production and properties, X-ray diffraction, photoelectric phenomena and some simple applications.

Fundamental particles, Van de Graff generator, linear accelerator, cyclotron. Nuclear stability. Fission atom bomb, C-N cycle, Hydrogen bomb. Uses and hazards of atomic energy.

Cosmic rays, showers, mesons, variation with height.

YEAR III-PRACTICAL WORK

PROPERTIES OF MATTER

1. 'g' by Bar Pendulum.
2. 'I' of a regular body by a torsional pendulum.
3. Young's modulus of a wire by (i) Searle's apparatus (ii) Optical lever.
4. Rigidity by Maxwell's needle.
5. Young's modulus of a beam by bending.
6. Elastic constants by Searle's method.
7. Poisson's ratio for rubber.
8. Surface tension by Jaeger's method.
9. Viscosity of a liquid by capillary flow method.

HEAT

10. Coefficient of expansion of a metal rod.
11. Coefficient of apparent expansion of liquid by specific gravity bottle or a pyknometer.
12. Pressure coefficient of air.
13. Specific heat of a liquid by (i) cooling (ii) electrical method.
14. Ratio of specific heat of air—Clement and Desome's method.
15. Thermal conductivity by Searle's method.
16. J—Callendar and Barne's method. Friction core method.

SOUND

17. Sonometer—measurement of frequency of a tuning fork.
    —density of material of a wire.
    —verification of laws of strings.
18. Measurement of velocity of sound by Kundt's tube.

OPTICS

19. Measurement of the focal length of combination of lenses by magnification method.
20. Measurement of the magnifying power of a telescope by slip method, scale method and microscope.
21. Measurement of (i) angle, (ii) heights, (iii) altitude, (iv) angular diameter of the sun by a sextant.
22. Measurement of the refractive index of glass and the dispersive power of a prism with a spectrometer.
23. Determination of the wave length with a grating.

24. Newton's rings– Determination of R of a lens.
25. Fresnel's bi-prism– Determination of the wave length of sodium lines.
26. Determination of the specific rotation of sugar solution by a polarimeter.

YEAR IV-PRACTICAL WORK

MAGNETISM

1. Verification of the inverse square law.
2. Measurement of H by Helmholtz galvanometer.
3. Measuring the angle of dip and keeping a record of its variation for a month.
4. To draw the hysteresis curve for a given iron ring.

ELECTRICITY

5. Measurement of the internal resistance of a cell by potentiometer.
6. Determination of the reduction factor of a tangent galvanometer.
7. Measurement of the E.C.E. of copper.
8. Determination of the resistance of a galvanometer by Kelvin's method.
9. Determination of the resistance of a pointer type galvanometer and its current sensitivity.
10. Determination of the resistance and current sensitivity of a reflection type galvanometer.
11. Use of a Carey Foster Bridge in determining (i) low resistances (ii) temperature coefficient of resistances.
12. Comparison of capacities using a reflection type galvanometer.
13. To draw a Temp.—E.M.F. curve for a thermocouple.
14. Determination of the capacitance of a given condenser.
15. Determination of the self-inductance of a coil.
16. Determination of the mutual inductance of a given transfer coil.
17. Drawing the characteristic courses for a triode value.
18. Determination of the simplification factor of a triode value.

Evaluation

Students should offer one theory paper at the end of the third year and two more theory papers at the end of the fourth year. Practical tests should also be given.

SYLLABUS—SCIENCE—BOTANY MAJOR

Year III / 6 Periods / One Paper / 150 Marks
Year IV / 9 Periods / Three Papers / 300 Marks

Nature and Purpose of the Sequence

This sequence is designed to prepare the teacher of botany in terms of the needed subject matter. Year IV should be taught in close relationship to the *Internship in Teaching* course.

Teaching Method

Lectures, demonstrations, seminars, and practical work should be employed. Guest lecturers should be utilized as well as field trips.

Content

YEAR III

Unit 1. General Morphology and Histology

1. Types of cell aggregates. Tissues and their functions. Structure and functions of meristematic and permanent tissues.
2. Form and functions of the root. Different types of root systems. Secondary growth.
3. Form and functions of the stem. Branching systems, significance and importance of different kinds of buds. Uses of stem for propagation in horticultural practices. Structure of dicotyledonous and monocotyledenous stems. Origin, structure and function of secondary tissues.
4. Form and structure of the leaf. Modifications of leaves. Functions of different tissues.
5. Types of inflorescences. Role of flower in sexual reproduction. Structure and function of the floral-organs, especially the anther and ovule. Fertilization.
6. Development of endosperm, embryo, seed and fruit. Different kinds of fruits. Dispersal of fruits and seeds.
7. Structure and germination of seeds. Conditions necessary for germination.

Unit 2. Morphology and life history of the following plants

a. Thallophyta

1. Bacteria : An account of their structure, method of reproduction and economic importance.
2. Algae : *Nostoc*, *Oscillatoria*, *Chlamydomonas*, *Volvox*, *Chlorella*, *Ulothrix*, *Oedogonium*, *Desmids*, *Spirogyra*, *Chara*, *Botrydium*, *Vaucheria*, *Diatoms*, *Ectocarpus*, *Fucus* (or *Sargassum*), *Batrachospermum*, *Polysiphonia*.
3. Fungi : *Cystopus*, *Phytophthora*, *Mucor*, *Yeast*, *Penicillium*, *Peziza*, *Ustilago*, *Puccinia*, *Agaricus*, *Fusarium*, *Cercospora*.
4. An elementary knowledge of the control of plant diseases caused by fungi, bacteria and viruses. Nature of virus.
5. A general account of lichens.
6. A knowledge of the economic importance of algae and fungi.

b. Bryophyta : *Riccia*, *Marchantia*, *Anthoceros*, *Porella*, *Sphagnum*, *Funaria*, *Polytrichum*.

c. Pteridophyta : *Rhynia*, *Lycopodium*, *Selaginella*, *Isoetes*, *Equisetum*, *Dryopteris*, *Marsilea*.

d. Gymnosperms : *Cycas*, *Pinus*, *Gnetum*.

e. Angiosperms : General account of structure and life history.

YEAR IV

Unit 1. Taxonomy

Historical development of taxonomical thought, general principles of classification; a study of the following families with special reference to local representatives and plants of economic importance.

a. Dicotyledons : Ranunculaceae, Caryophyllaceae, Papaveraceae, Cruciferae, Malvaceae, Leguminoceae, Rosaceae, Rutaceae, Umbelliferae, Myrtaceae, Asclepiadaceae, Scrophulariaceae, Convolvulaceae, Solanaceae, Acanthaceae, Labiatae, Cucurbitaceae, Rubiaceae, Compositae, Moraceae, Euphorbiaceae.

b. Monocotyledons : Liliaceae, Palmeae, Orchidaceae, Musaceae, Gramineae.

Unit 2. Physiology

a. Osmosis and osmotic pressure. Turgor pressure. Imbibition. Permeability.

b. Plant nutrition : Carbon assimilation; influence of internal and external factors. Law of limiting factors. Translocation

and utilization of carbohydrates for growth and respiration. Enzymes. Storage and mobilization of reserve carbohydrates. Mineral nutrition of plants, role of trace elements. Fat and nitrogen metabolism.

c. Respiration, aerobic, anaeobic; respiratory quotient; factors affecting rate of respiration; respiratory enzymes, respiration in relation to storage of fruits.

d. Intake and ascent of water in plants. Rate of transpiration and its significance. Relation between stomata and transpiration.

e. Growth and movements; hormones; physiology of reproduction.

f. Germination of seed; dormancy and longevity : methods of breaking dormancy; dormancy of vegetative buds; methods of prolonging or of breaking such dormancy.

Unit 3. Ecological anatomy, plant succession; local vegetation.

Unit 4. Mendel's laws of inheritance and some of their modifications; linkage; polyploidy, hybridization.

Unit 5. Methods of plant breeding.

Evaluation

One theory paper and one practical test should be given at the end of year III. Two theory papers and one practical test should be given at the end of year IV.

SYLLABUS—SCIENCE—ZOOLOGY MAJOR

Year III / 6 Periods / Two Papers / 150 Marks
Year IV / 9 Periods / Three Papers / 300 Marks

Nature and Purpose of the Sequence

This sequence is designed to provide the specialized subject matter needed by a teacher of zoology. The fourth year should be taught in relationship with the course *Internship in Teaching.*

Teaching Method

Lectures, demonstrations, seminars, and practical work should be utilized. Educational tours should be used, especially field trips.

Content

YEAR III

Unit 1. Protozoa

General characters and classification. Complete account of Entamoeba, Elphidium, Trypanosoma, malarial parasite and Paramecium. Protozoa and disease.

Unit 2. Porifera

General characters. Structure and development of a calcareous sponge. Comparative account of canal system. Histology Reproduction.

Unit 3. Coelenterata

Complete account of *Obelia*, *Aurelia*, sea anemone and *Hormiphora*, coral formation. Polymorphism. Economically important corals.

Unit 4. Platyhelmia

General characters of the group. Structure and life history of planarians, liver-fluke and tape-worm. Parasitism.

Unit 5. Nematoda

Ascaris, structure and life history. Nematode parasites of man.

Unit 6. Annelida

Structure, habits and development of Neries, earthworm, leech.

Unit 7. Arthropoda

General characters and classification. Complete account of prawn, cockroach, scorpion, *Peripatus*. Trophi of insects. Metamorphosis of insects. Useful and harmful insects in relation to man.

Unit 8. Mollusca

General characters and classification. Complete account of fresh water mussel, snail and sepia. Foot, shell, respiratory and nervous systems of molluscans.

Unit 9. Echinodermata

General features and classification. Complete account of starfish. Main features of Ophiuroidea, Echinoidea, Holothuroidea and Crinoidea. Larval forms.

Unit 10. Phylogeny of invertebrate groups

Unit 11. Eggs and their cleavage

Gastrulation, development of chick. Foetal membranes. Placenta. Elementary facts about organizer phenomena.

Unit 12. Fossils and their importance

Brief account of fossil Echinoderms. Brachiopods, Trilobites, fishes and reptiles. Palaeontological history of horse, camel, elephant and man.

YEAR IV

Unit 1. Protochordata

Structure and development of *Balanoglossus*, simple *Ascidian*, *Amphioxus*.

Unit 2. Chordata

Distinctive features of Cyclostomata; affinities, brief account of Holocephali. Eusclachii. Structure of bony fish. Indian examples of bony fishes. Respiratory organs, migration.

Unit 3. Amphibia

General characters, Classification and examples. Detailed anatomy, development and metamorphosis of frog.

Unit 4. Characters of Reptilia

Classification of modern reptiles. Examples of Indian snakes.

Unit 5. Distinctive features of Archeornithes and Neornithes

Origin of birds. Detailed anatomy of pigeon. Nesting habits and migration. Acquaintance with Indian birds.

Unit 6. General characters of mammalia

Classification, distinctive features with examples of Prototheria, Marsupialia, Catecea, Chiroptera, Ungulata, Carnivora and Primates. Common mammals.

Unit 7. Phylogeny of chordate groups

Evaluation

One theory paper and one practical test should be given at the end of year III. Two theory papers and one practical test should be required at the end of year IV.

SYLLABUS—SCIENCE—MATHEMATICS (MAJOR)

Year III / 6 Periods / Two Papers / 100 Marks
Year IV / 9 Periods / Three Papers / 300 Marks

Nature and Purpose of the Sequence

This sequence is for those students majoring in mathematics. It is designed to provide the specialized mathematics needed by a teacher of mathematics.

Teaching Method

Lectures, seminars, and discussions would be the principal methods used. The latest developments in mathematics should be included.

Content

Unit 1. Vectors and Mechanics

Scalars and vectors. Vector addition. Scalar and vector multiplication. Differentiation of vector functions of a scalar variable.

Forces acting at a point. Parallel forces. Moments. Couples. General conditions of equilibrium of co-planar forces. Friction. Centre of gravity (simple cases involving at most one integration). Easy cases of virtual work.

Velocity vector. Relative velocity. Acceleration. Rectilinear motion. Simple harmonic motion. Motion in a plane. Projectiles.

Unit 2. Geometry

(Plane) General equation of second degree in homogeneous Cartesian Coordinates. Reduction of the 2nd degree equation.

(Solid) Direction cosines of straight lines. Planes and straight lines. Equations for the sphere, cone, cylinder. Ellipsoid, hyperboloids and paraboloids.

Unit 3. Algebra

Summation of finite series. Finite differences. Continued fractions. Inequalities (A.G. Mean, Cauchy-Schawartz, Holder and Minkowski).

Cardan's solution of the cubic. Solution of biquadratic by fac-

torization. Nature of roots of the cubic. Descarte's rule of signs. Newton's method of divisors. Newton's method of approximation to roots. Horner's method for roots up to 3 decimal places.

Unit 4. Trigonometry

Demoivre's theorem for rational indices. Binomial equations. Summation of finite trigonometric series.

Unit 5. Calculus

Rolle's theorem. (Geometrical proof). Mean value. Theorems. Taylor's theorem. Indeterminate forms. Maxima and minima. Partial differentiation. Asymptotes. Singular points. Curvature. Envelopes. Tracing of curves.

Numerical integration by Simpson's method. Differentiation under the integral sign as method of integration. Formal double and triple integration.

Unit 6. Infinite Series and Products

Infinite series with positive terms. Basic comparison tests. Root tests. Ratio tests. Kummer test. Condensation and integral tests. Alternating series. Series of arbitrary terms. Absolute convergence. Theorems on derangement and multiplication of absolutely convergent series. Examples of conditionally convergent series. Examples to show the effects of derangements on conditionally convergent series. Elementary discussion of infinite products. Infinite products for the sine and cosine functions.

Unit 7. Projective Geometry

Prjection, ross ratio, harmonic ranges, inversion and reciprocation.

Unit 8. Principles of Mathematics

Text : Principles of Mathematics by Allendoerfer and Ookley, McGraw Hill, 1953, Chapters I, II, III, IV, V, VI, VII, VIII, IX, X and XIII.

Unit 9. Details

Logic ; undefined terms. Definitions. Postulates. Quantifiers. Truth tables. Laws of Logic. Negations. Methods of proof. Sets. Relations between sets. Natural numbers. Induction. Integers. Congruences. Rationals. Decimals. Reals. Complex numbers. Groups. Fields. Boolean Algebra. Functions. Algebra of functions. Graph of a function. Inverse function. Function of several variables. Algebraic functions. Trigonometric functions. Exponential and logarithmic functions. Limits. Theorems on limits. Continuity.

Unit 10. Statistics of Probability

Nature of statistics. Sampling presentation of data. Frequency distributions. Grouping. Averages. Means. Mode. Medium. Standard deviation. Probability. Expertation. Binomial distribution. Normal distribution.

In the 4th year, a non-examination course based on chapters one to six of Introduction to the Foundations of Mathematics by R.L. Wilder (John Wiley, New York) should be given to those who are going to teach Mathematics in higher secondary classes. Also these students should be encouraged to read *What is Mathematics* by Courant and Robbins, Oxford University Press, especially chapters I, II, IV, VI, VII and VIII.

Evaluation

Evaluation should be by units, years, and the total sequence. Emphasis should be placed on terminal examinations.

THE TECHNOLOGY PROGRAMME

The programme in technology is designed specifically to prepare teachers of technical-industrial subjects for the multipurpose secondary schools of India. As multipurpose secondary schools increase in number, the shortage of trained technology teachers will become even more acute. No formal programme now exists which provides such preparation, and teachers presently in the schools have been educated for related but different purposes. Since the product of this scheme will be a secondary school teacher rather than an engineer, technician, or craftsman, this programme represents a significant new development in teacher education designed to prepare technology teachers for multipurpose schools.

The scheme of courses in the technology programme provides the subject-matter or content for the teacher. Two years of science and mathematics preparation, identical with physical science students, serves to strengthen the content. The general education programme provides learning experiences designed to produce the well-educated man. The professional education sequence of courses serves to provide the student with the philosophy, methods and techniques of the teaching profession, with special reference to technical-industrial subjects.

The scheme of subject-matter courses given below provides for the preparation of two slightly different kinds of technology teachers for multipurpose schools. The first two years of content subjects are common for all technology students. During the last two years of the programme, special subjects are offered to prepare the teacher who will be working with the college preparatory pupils in the multipurpose schools, especially, those pupils who wish to enter higher technical education. College students in this category will be known as the Engineering Sciences Group.

Four-year programme will also prepare teachers to teach the employment preparatory classes of the higher secondary schools. These courses will be introduced during the last two years and the college students in this category will be known as Engineering Trades Group. Much is common in the two programmes, but a different emphasis is placed on the theoretical in the first instance and on the practical or skill development in the second

instance. The major objective of this scheme is, therefore, to provide sufficient breadth and depth of content for teachig at the secondary school level.

The total instructional programme of the colleges is shown in Table no. 7 (page No. 55). The specific courses in technology are shown in Table no. 101 (page No. 58).

The syllabi are presented as outlined.

SYLLABUS—TECHNOLOGY—APPLIED MECHANICS AND ENGINEERING MATERIALS

Year II / 4 Periods / Two Papers / 100 Marks
Year II / 2 Periods / One Paper / 50 Marks

Nature and Purpose of the Sequence

This sequence is a common requirement for all technology-majors. It is designed to provide students with an understanding of the nature and properties of the materials with which they will be working. Simple principles of mechanics and demonstrations of their applications are also taught.

Teaching Method

Instruction will be integrated between theory and practice. Separate sessions will not be scheduled for theory and practice in isolation. The applied mechanics content will be coordinated with the offerings in physics to prevent undesirable overlap and to provide applications of relevant theory. The instruction on materials will similarly be coordinated with the studies in chemistry and geology.

Content

YEAR I

Unit 1. Applied Mechanics

Vector and scalar quantities. Parallelogram law; triangle rule; resolution of vector into components; resultant; equilibrium of any number of co-planar, concurrent and non-concurrent forces; relative velocity; motion down an inclined plane.

Co-planar parallel forces : moments; composition and resolution of like and unlike parallel forces.

Couple : moments of a couple; resultant of couples in the same plane; replacement of a force by a force and a couple.

Centre of gravity : centre of a system of parallel forces in different planes; determination of Centre of gravity. by taking moment about a line.

Equilibrium of any number of forces in one plane : stable, unstable and neutral equilibrium.

Velocity ratio : efficiency; mechanical advantages. Lever as a machine: wheel and axle ; pulley, inclined plane, screw. Laws of friction : friction of simple machines (pulley, wheel and axle, inclined plane).

Momentum, work and energy : principle of virtual work—rate of work (Watt and H.P.), kinetic and potential energies; graphical representation of work done by (a) constant force, (b) uniformly increasing force, and (c) variable force units and dimensions (M.L.T.) for force, momentum, energy and power; impact of two spheres, loss of K.E. after impact.

Graphical statics and stresses in rods : resultant of a number of forces in one plane; parallel forces; triangular frame loaded at apex (Warren girder, lattice girder).

Unit 2. Engineering materials—Building materials

Stone : classification and varieties : characteristics, suitability for structures. Deterioration : artificial preservation. Quarrying, blasting and dressing. Various explosives and their storing. Line of least resistance.

Bricks : titles, fire-bricks and terra-cotta, composition of earth. Moulding. Drying, clamps and kilns; loading them and burning. Sizes and weights. Characteristics and essential features.

Lime : Methods employed in manufacture, fat lime, hydraulic lime; their burning and slaking. Conversion of fat lime to hydraulic lime. Essential features. I.S.I. specifications for limes.

Lime, concrete and mortars : Sand and *surki*, their properties and uses. Preparation of mortars. Various proportions of aggregates in mortars. Mixing, laying and curing concrete. Specifications for concrete.

Timber : Growth and structure. Felling, converting, and seasoning. Decay and methods of preservation. Common defects. Selection of good timber. Market forms of timber. Kinds and characteristics of timber commonly used in India.

Miscellaneous : Plastering and pointing. White and colour-washing. Distempering. Paints and other building materials such as asbestos and galvanized iron sheets, bitumen, asphalt, glass; their uses and properties.

Portland Cement : Composition, outlines of manufacture, requirements of good cement. Effects of chemical constituents. Nature

of setting, physical proportion, shrinkage, growth of strength with age. Effect of storage and sampling.

Aggregate : coarse aggregate, shingle, gravel, broken stone. Kinds available in India and their sources.

Use and limitation of broken brick : *Jhama*, *kankar*, nodule, fine aggregate, and screenings, prohibited materials.

Unit 3. Engineering Materials—Metallic materials

Cast irons : grey, malleable and nodular. Carbon steels, low alloy and high alloy steels. Tool steels and other tool materials. Aluminium and its alloys. Copper and its alloys. Bearing materials.

YEAR II

Unit 1. Strength of Materials

Definition of load; stress, strain, elasticity, tension, compression, transverse stress, shear, bearing-pressure, elastic and plastic stages, elastic limit, yeild point, ultimate strength. Young's modulus. Hook's law, Factor of safety and explanation of stress, strain and elastic limit of proportionality. Yield point. Ultimate stress and elasticity with the help of stress/strain diagram for mild steel. Modulus of rigidity.

Strees : tensile, compressive and shearing for homogenous and uniform sections. Simple problems.

Strain : longitudinal, lateral, volumetric and shearing homogenous materials. Poisson's ratio. Simple problems.

Problems on stress in compound bar and composite sections, stress due to temperature variation.

Bending moment and shearing force in cantilevers and simply supported beams with or without over-hangs; bending moment and shearing force diagrams for simple cases of loading in cantilevers and beams. Points of contraflexure. Moment inertia. Section modulus of simple beam rectangular solid and hollow circular and I-sections

Stresses in simple beams and cantilever due to bending. Application of formula $\frac{f}{y} = \frac{M}{I} = \frac{E}{R}$

Simple cases of combined bending and direct stresses. Calculations for hoop and axial stresses in thin cylinders due to internal fluid pressure.

Torsion and shearing stresses in solid and hollow shafts. Power transmitted by these shafts.

Stresses in simple framed structures due to dead loads by graphical method.

Unit 2. Testing

Testing of materials and testing machines : use of machine of tension, compression transverse and shearing, tests of steel and timber specimens. Creeping of metals. Fatigue of metals. Hardness and impact tests of steel. Tension and compression tests of concrete.

Evaluation

The evaluation of student progress will be based upon sessional work and assignments and upon periodic examinations by the instructor.

SYLLABUS—TECHNOLOGY—ENGINEERING DRAWING AND DESIGN

Year I / 3 Periods / No Paper / 50 Marks
Year II / 4 Periods / One Paper / 100 Marks
Year IV / 4 Periods / No Paper / 50 Marks

Nature and Purpose of the Sequence

The content and practice sequence provide the technology majors with an understanding of and the ability to use the language of the draughtsman.

It provides technology majors with introductory studies and practice in descriptive geometry, machine drawing, building drawing and electrical drawing. The fourth year course for the Engineering Science, Group only is to provide experience in elementary mechanical design.

Teaching Method

The sequence is organized to provide an overview of the common fields of drafting. The fourth year course for the Engineering Science Group builds on and extends the mechanical design understandings and abilities of this group. The theory and practice of drafting are to be taught in an integrated course with the instructor teaching the theory and practice as they interrelate. Separate sessions for theory and practice will not be scheduled.

Content

YEAR I

Unit 1. Instruments and Equipment
Types and grades of pencils, drawing paper, drawing instruments, mechanical lettering devices, scales, parallel straight edge and drafting machines, T-squares, set-squares, special guides and templates.

Unit 2. Geometrical Constructions
Bisection of lines and angles, reducing or enlarging linear dimensions, drawing tangents, constructing any regular polygon on a given straight line, inscribing polygons in circles, involute of a circle, spiral of Archimedes, methods of ellipse construction.

Unit 3. Geometry of Solids ad Planes

Cylinders, cones, prisms and pyramids. Intersections of these solids with planes and other solids. Surface development.

Unit 4. Multi-view Drawing

Uniplaner orthographic projection (comparison of first angle and third angle projection), alphabet of lines, sections, auxiliary views and revolutions, the making of working drawings, theory of dimensioning, notes and titles, pencil and ink tracings.

Unit 5. Pictorial Drawings

Multiplaner orthographic projections in isometric only, isometric drawing, oblique drawing, and perspective drawing.

YEAR II

Unit 1. Machine Drawing

Freehand sketching of simple machine parts; screws, bolts, rivets and other fasteners, keys and keyways, cams and gears, simple machine parts and assembly drawings. Working drawings of details of machine parts and working drawings of the assemblies of these parts.

Unit 2. Architectural and Structural Drawing

Styles of lettering, nomenclature of homes and buildings, symbols for building materials, floor plans, elevations, and structural shapes. Complete layout, plan and elevation of a building according to architectural specifications.

Unit 3. Electrical Drawing

Graphical symbols, circuit drawings, schematic and pictorial diagrams.

Unit 4. Reproduction of Drawings

Types of materials and processes and their uses.

YEAR IV

(Engineering Sciences Group Only)

Elementary tool and machine design—development of working drawings of mechanical devices making use of standard parts, fasteners and fittings; solution of mechanical design problems according to specifications and employing cams, gears, and various kinds of bearings.

Evaluation

The evaluation of student progress in the first year will be based upon sessional work. In the second year the evaluation will be based on one paper and sessional marks, with equal emphasis on each. The fourth year course will be primarily the application of drafting knowledge and skills to design problems. Here the evaluation will be on performance in developing working drawings of devices.

SYLLABUS—TECHNOLOGY—WORKSHOP TECHNOLOGY AND PRACTICE
Years I to IV / 4 Periods each year / No Papers / 200 Marks

Nature and Purpose of the Sequence

The content and activities covered in this sequence are designed to provide technology majors with basic tool and machine skills, with basic knowledge about, and experience in the correct use of common industrial materials and processes, with basic industrial design, and with knowledge of industrial management, organization, and production. The sequence forms the core of the technology programme for all majors.

Teaching Method

Students will first receive instruction in basic skills, on common materials, and on common processes. The instruction will be integrated theory and practice. Separate sessions will not be scheduled for theory and practice in isolation. For example, if students need certain formulae in connection with the machining of a gear, at that point the shop activities will be interrupted for the requistie lectures and/or demonstrations. Workshop activity will immediately resume after the necessary information has been provided.

The sequence culminates with a group activity which stimulates an industrial undertaking. Students begin with a market analysis and proceed through design, testing, and producing a product. Production organization and control and personnel management are also considered.

Content

YEAR I

Unit 1. Power, Safety and Care

Safety in shop, mechanical and other accidents, safety devices, electrical accidents, power and driving of machines, belt driving, gear driving, chain driving, shafting, bearings, lubrication, care and order in workshops.

Unit 2. Forging, Rivetting, Soldering and Brazing

Hand forging, forge and tools, upsetting, drawing down, bending, punching, welding, mechanical forging power hammers, drop forging, rivetting, soldering, brazing and silver soldering.

Unit 3. General Woodworking

Practice in elementary woodwork and pattern making.

Unit 4. Bench Work

Bench, vice, hammers, centre punch, chisels and files, taps and drills, checking and measurement of surfaces, tests for accuracy, flatness, squareness, roundness, concentricity, angle measurement, vernier protractor, steel rule, calipers micrometer, vernier caliper, use of gauges, metric system—metric micrometer and vernier, chipping, scraping, metal cutting with hacksaw.

Marking tools, angle plate, V-block, parallel strips, spirit level, divider, scribing block, marking out, drilling, taps and dies, taping, threads cutting.

YEAR II

Unit 1. Advanced Benchwork

Accuracy, interchangeability and gauging various limit systems, limit gauges, indicating gauges, operation gauges.

Unit 2. Measurement and Precision Work

Slip gauges, comparator, vernier height gauge, marking out, vernier micrometer, examples of measurement.

Unit 3. Foundry

Moulding, loam moulding, machine moulding, core making, special cores for pipes and cylinders, moulding and care, grades of moulding sand, testing of moulding sand, cupola and its operation. Fettling and dressing of casting, casting of non-ferrous metals and alloys, die casting, machine moulding.

Unit 4. Welding

Gas welding, effect of flames, effect of nozzle size and gas pressure, choice of blow pipes, flame cutting, high pressure and low pressure welding. Electric arc welding, AC & DC welding and their characteristics, electrodes.

Unit 5. Turning

Lathes, specification and classification, various types of operations on a lathe, turning tools, capstan and turret lathes, tool layout including use of multiple tool holders and work holding fixtures, method of thread production.

YEAR III

Unit 1. Shaping Machines

Principles, drives and feeds, return motions, tools, job-holding devices, types of operations.

Unit 2. Milling Machines

Vertical, horizontal, universal specifications, milling operations, setting of tools for different operations. Setting up and holding work for accuracy, dividing head, indexing, plain and differential gear cutting and thread cutting on milling machines. Tools and cutters for milling machines.

Unit 3. Drilling Machines

Fixed spindel, radial and universal—multiple head drilling machines, drills and accessories, grinding of drills, tapping on drilling machine.

Unit 4. Grinding

Types of grinding machines, surface, cylindrical and internal grinding, types of job and finish, grinding wheel forms and specification, speeds and feeds, wheel dressing, thread grinding, cutter and tool grinding—job holding devices.

Unit 5. General Electricity and Electronics

Exercises involving the use of common electrician's tools and the tools and test equipment used by the radio and TV repairman. Motor repair, residential and industrial circuitry, and electronic circuitry.

YEAR IV

Industrial Design and Industrial Production

Study of prominent industrial designers and their work, principles of design, functional adequacy, advantageous use of materials, organization, proportion and balance, colour, craftsmanship. The design process; define the problem or need, plan solutions, study available tools, materials, and process. Experiment, make pilot model, evaluate and redesign. Practice in designing both individual and mass production products. Industrial organization and management; type, functions, training. Production research and development, industrial application of industrial design, design and develop prototype, production engineering, quality control. Planning and operating a model factory; plan organization, plan production (both material and personnel needs), produce products.

Evaluation

The evaluation of student progress will be based upon sessional work as assigned by the instructor. Emphasis will be placed on skill performance and ability to integrate the knowledge and skills in the production of projects according to high standards of workmanship.

SYLLABUS—TECHNOLOGY—ELEMENTS OF ENGINEERING

Year III / 10 Periods / One Paper / 100 Marks
Year IV / 10 Periods / Two Papers / 200 Marks

Nature and Purpose of the Sequence

This sequence provides the necessary background to enable students in the Engineering Science Group to teach elements of engineering in secondary schools. The intent is not to produce graduate engineers but rather to develop qualified multipurpose secondary school teachers of basic engineering principles and practices. The fourth year course should be related to *Internship in Teaching.*

Teaching Method

The basic theory and practice of the common engineering fields are to be taught in common sessions. Activities, experiments, lectures, demonstrations, and experiences are to be integrated under the supervision of a teacher. Specialists from the staff will teach the respective units.

Content

YEAR III

Unit 1. The Engineer and His Work

The preparation of engineers; the work of the engineer; the relationship of the engineer to the tradesman, technician, and scientist.

Unit 2. Elements of Civil Engineering

a. Surveying :
   (1) Chain surveying
   (2) Prismatic compass surveying
   (3) Levelling
   (4) Plane table surveying

b. Building Construction :
   (1) Brick work
   (2) Various kinds of masonry

(3) Woodwork
(4) Foundations
(5) Concrete work
(6) Miscellaneous—Various types of flat and pent roofs, their details of construction and drainage. Roof covering. P.W.D. specifications for roof and fixing covering. Ceilings; floors, various kinds, their details of construction and specifications. Partitions, staircases, plastering and pointing, painting and decorating.

White washing, colour washing and distempering.

Selection of a site for building, orientation of building, arrangements of rooms. Ventilation in a building.

c. Hydraulics :
(1) Static pressure of Liquids
(2) Static pressure
(3) Floating bodies
(4) Fluids in motion
(5) Pressure gauges
(6) Venturimeter
(7) Flow through orifices and mouthpieces
(8) Flow through pipes
(9) Flow through open channels
(10) Impact of water
(11) Reciprocating pumps
(12) Turbines

d. Water Supply Engineering :
(1) Water consumption for domestic, flushing and industrial purposes
(2) Conveyance of water
(3) Sewerage and sewage disposal
(4) Repairs of roads, streets and pavements
(5) Street lighting

Unit 3. Elements of Electrical Engineering

Direct Current :
(1) Electro-magnetic induction
(2) D. C. generators
(3) D. C. motors
(4) Losses, efficiency and testing of D. C. machines

(5) Parallel operation of D. C. generators
(6) D. C. distribution
(7) Measuring instruments

YEAR IV

Unit 1. Elements of Electrical Engineering (continued)

a. Alternating Current :
(1) General field of use of alternating currents
(2) Alternating current circuits
(3) Polyphase systems
(4) Transformers
(5) Alternators
(6) Rotating magnetic fields
(7) Synchronous motor and induction motor
(8) Alternative current instruments
(9) Converting machines
(10) Rectifiers

b. Generation and Utilization :
(1) Generation of electrical energy
(2) Transmission of electrical energy
(3) Voltage regulation stability
(4) Switch gear and protection
(5) Utilization
(6) Illumination

Unit 2. Elements of Mechanical Engineering

a. Heat Power :
(1) Thermodynamics
(2) Fuels and combustion
(3) Internal combustion engines
(4) Properties of steam
(5) Boilers
(6) Steam engines
(7) Steam turbines
(8) Condensers
(9) Air compressors
(10) Refrigeration

b. Theory of Machines :
   (1) Friction, lubrication and bearings
   (2) Belt, rope and chain drive
   (3) Brakes and dynamometers
   (4) Cams
   (5) Toothed gearing and gear trains
   (6) Governors
   (7) Flywheels and turning moment
   (8) Valve diagrams and valve gears

Evaluation

The evaluation of student progress will be based on sessional work and assignments and on periodic examination by the instructor.

SYLLABUS—TECHNOLOGY—INTRODUCTION TO ENGINEERING

Year IV/4 Periods/One Paper/100 Marks

Nature and Purpose of the Sequence

This course provides the Engineering Trades Group with an overview of the engineering profession. The content will enable prospective teachers, in schools which can employ a single technical teacher, to teach both engineering trades and elements of engineering.

Teaching Method

The course is organized to provide an overview of the most common engineering fields. The theory and practice of basic engineering are to be taught in an integrated course with the instructor teaching these elements as they interrelate. Theory and practice generally are to be taught in each session. The engineering applications of mathematical and scientific theories are to be shown.

Content

Unit 1. The Engineer and His Work

The preparation of engineers, the work of the engineer, the relationship of the engineer to the tradesman, technician, and scientist.

Unit 2. Civil Engineering

Basic principles and practices of surveying, building construction, hydraulics and sanitary engineering. Transportation system construction.

Unit 3. Electrical Engineering

Basic principles and practices of power generation, transmission, distribution and utilization. Electrical and electronic communications system. Data processing.

Unit 4. Mechnical Engineering

Basic principles and practices : combustion engineering; mechanical design; automotive, marine and aeronautical engineering.

Evaluation

The evaluation of student progress should be based on sessional work and assignments and on periodic examination by the instructor.

SYLLABUS—TECHNOLOGY—ENGINEERING TRADES MAJOR

Year III/10 Periods/One Paper/200 Marks
Year IV/10 Periods/One Paper/200 Marks

Nature and Purpose of the Sequence

In the third year, each student in the Engineering Trades Group will select *one field of trades* which he will then pursue for two years. The experiences provided in this major block of time should help the student to gain the necessary manipulative skill and related knowledge to teach a general engineering trade in the multipurpose high school. The fields of engineering trades which are taught in each Regional College of Education will be adjusted to the employment situation existing in each college region. The offerings will need to be readjusted periodically in response to changes and trends in the regional employment situation.

Teaching Method

Each student will receive instruction in basic skills, on common materials, and on common processes within one field of engineering trades. The instruction will be integrated between theory and practice. As related instruction is needed to clarify and extend on-going work, presentations will be made and the laboratory work will immediately continue. The goal of this instruction is to develop the student into a knowledgeable practitioner in one field of engineering trades while developing a knowledge of how to efficiently instruct multipurpose high school students in this field. The instruction should be centered around meaningful jobs rather than upon exercises. In the fourth year some actual production and/or service work should be required.

Content

These instructional units are listed to indicate the scope of the instruction. They imply no order or sequence of instruction. It is assumed that all the units will be covered but many will be studied concurrently with others.

General Machinist and Fitter Option

Unit 1. Safety precautions, safe work habits, treatment of shop injuries

Unit 2. Properties of ferrous and non-ferrous metals and common alloys. Tests for metal identification
Unit 3. Heat treatment of metals and alloys
Unit 4. Common metal-working hand tools; their use, care and maintenance
Unit 5. Common layout tools, their care and usage
Unit 6. Precision measuring instruments and gauges their care and usage
Unit 7. Common metal-working machines; their use, operation, care, and maintenance
Unit 8. Surface finishing
Unit 9. Drilling, reaming and broaching
Unit 10. Metal fasteners and their uses
Unit 11. Interchangeability, fits, limits, tolerances and allowances
Unit 12. Construction and use of templates, jigs, and fixtures
Unit 13. Dismantling and refitting of machines and parts
Unit 14. Tool and cutter sharpening
Unit 15. Lathe operation and maintenance
Unit 16. Grinder operation and maintenance
Unit 17. Mill operation and maintenance
Unit 18. Drill press operation and maintenance
Unit 19. Shaper operation and maintenance
Unit 20. Estimation of materials and costs. Organizing and managing the small shop

General Welder Option

Unit 1. Safety precautions, safe work habits, treatment of shop injuries
Unit 2. Various types of welding processes and their uses
Unit 3. Gases used by welders and their properties, storage and use
Unit 4. Common hand tools of the welder and their care and use
Unit 5. Operation of low-pressure welding systems
Unit 6. Operation of high pressure welding systems
Unit 7. The metallurgy of welding, brazing and soldering
Unit 8. Gas welding and brazing rods and fluxes. Solders and fluxes
Unit 9. Common types of gas welded and brazed joints and their uses
Unit 10. Preparation for gas welding and brazing. Control of distortion
Unit 11. Cleaning and finishing of welds
Unit 12. Electricity as it applies to welding
Unit 13. AC and DC welders and welding

Unit 14. Electrodes and fluxes
Unit 15. Common types of are welding and their uses
Unit 16. Hard facing of metals
Unit 17, Flame and arc cutting of metals
Unit 18. Resistance welding. Shielded arc welding
Unit 19. Inspection and testing of welds. Welding standards
Unit 20. Estimation of maerials and costs. Organizaing and managing a small shop

Power Electrician Option

Unit 1. Safety precautions, safe work habits, treatment of shop injuries Resuscitation and treatment for electrical shock
Unit 2. Care and use of common electrician's hand tools
Unit 3. Common insulators, their properties and uses
Unit 4. Common conductors, their properties and uses. Standard wire gauges and usage of wire tables
Unit 5. Measuring and testing instruments used by the electrician
Unit 6. Indian electrical standards and conventions
Unit 7. Common residential circuits and wiring
Unit 8. Common commercial circuits and wiring
Unit 9. Electrical power generation systems
Unit 10. Electrical power transmission and control
Unit 11. Battery installations, their types, care and maintenance
Unit 12. Maintenance and repair of electrical appliances
Unit 13. Maintenance and repair of electrical generators and motors
Unit 14. Electrolysis and electroplating
Unit 15. Installation and repair of transformers and voltage regulators
Unit 16. Installation and repair of converters and rectifiers
Unit 17. Automotive ignition system, maintenance and repair
Unit 18. Automotive electrical system, maintenance and repair
Unit 19. Servicing, measuring and testing instruments
Unit 20. Estimation of materials and costs. Organizing and managing a small shop

Radio and Television Mechanic Option

Unit 1. Safety precautions, safe work habits, treatment of shop injuries Resuscitation and treatment for electrical shock
Unit 2. Use and care of common hand tools used by the radio and television repairman

Unit 3. Use and care of common measuring and testing devices, AC and DC
Unit 4. Review of electrical principles as they relate to radio and television repair
Unit 5. Elementary wave theory as it relates to the propagation, transmission, and reception of sound and pictures
Unit 6. Electron tubes, their principle of operation, classification and uses, use of AC and DC circuits
Unit 7. Detection. Circuits in general use
Unit 8. Resonance and tuning
Unit 9. Common types of microphones and speakers, their principles of operation, classification, and uses
Unit 10. Power supplies
Unit 11. The superheterodyne receiver
Unit 12. Short wave sets
Unit 13. Power oscillators and amplifier circuits
Unit 14. Radio telephone and telegraph
Unit 15. Frequency modulation; principles and applications
Unit 16. Very high and ultra high frequency, principles and applications
Unit 17. Radio and TV antennas
Unit 18. TV picture circuits
Unit 19. Fascimile, carrier communication , and industrial electronics
Unit 20. How to organize and manage the small repair shop

Carpentry Option

Unit 1. Safety precautions, safe workhabits, and treatment of shop injuries
Unit 2. Care and use of common hand tools
Unit 3. Care and use of common power tools and machines
Unit 4. Types and sources of woods and wood identification
Unit 5. Standard types of wood used in construction; standards, specifications, and costs
Unit 6. Panelling and panelling materials; standards, specifications, uses, and costs
Unit 7. Common wood fasteners
Unit 8. Glues and jointing compounds, their preparation and use
Unit 9. Common fittings and hardware used in construction
Unit 10. Abrasives used in wood finishing. Surface preparation for finishing

Unit 11. Wood finishing. Fillers, stains, natural and artificial protective coatings. Waxes and polishes

Unit 12. Wood maintenance and refinishing

Unit 13. Cabinet construction

Unit 14. Common woodworking joints and their uses

Unit 15. Methods of laying out and fabricating special wooden objects such as wheels, staircases and trusses

Unit 16. Form building for concrete work

Unit 17. Scaffolding construction and use

Unit 18. Furniture construction

Unit 19. Wood turning

Unit 20. Estimation of materials and costs. Organizing and operating the small shop

Evaluation

The primary criterion in the evaluation of student performance and teaching effectiveness in engineering trades should be the ability of the student to apply theory and skill to the performance of routine jobs within the field of trades studied. Assessment should include performance testing and evaluation of sessional work as well as written tests covering theory and practice.

B. THE ONE-YEAR PROGRAMME

General Plan of the One-year Programme

The one-year programme is designed to meet the urgent need for the education of teachers in multipurpose schools. If the four-year programmes are successful, some or all of the one-year programmes outlined may become four-year programmes. Even so, the need to prepare teacher in a one-year programme after graduation may continue for a long time.

The one-year programme for various types of teachers as outlined call for concentrated work for a long school year. The basic elements consist of some general education, considerable professional education and an essential minimum of subject-matter review and new subject matter. The relative emphases of the basic elements of the programme grow out of the fact that all students will be diploma or degree holders when they enter the college.

Admission

Candidates who have passed the first degree examination will be eligible for admission. Priority of admission will be given to inservice teachers deputed by their states. The College Management Committee will specify the number of seats that shall be allotted to each state. Some seats may be made available to candidates who are otherwise eligible.

Instructional Plan

The instructional plan is closely integrated and all courses will be taught in close relationship. For convenience the plan is divided into two blocks, the morning session for all general and professional courses and the afternoon session for departmental work. The arrangement of time in blocks should facilitate team teaching.

The plan places a heavy responsibility on the departmental staff. The departmental staff should take advantage of the block of time and refrain from breaking it into ineffective fragments.

All courses are to be related to student field experiences. Careful attention should be given by all instructors to the plan in Part II, *Student Field Experiences* and to Part III *Syllabus—One-year programme—Internship in Teaching.*

The work in subject-matter content in each area is not expected to be extensive except in those cases where the student shows a major subject-matter deficiency. The criterion for selection of subject matter is the requirement of the secondary school syllabus in the area under consideration.

THE TOTAL SCHEDULE

The time-table is shown on Page 35. The Saturday schedule presents another opportuuity for individual work since workshops will remain open under the supervision of instructors. This permits individual work, based on test results and guidance to be carried out by the student on Saturdays.

Integrated Common Programme of General and Professional Education

The programme for the five morning periods is designed as an integrated, common programme and is fundamentally, directly related to the departmental programmes in the afternoon.

About thirty per cent of the total time has been allotted to independent study and activities, in order to enable students to devote a significant portion of the working day to independent self study. It is hoped that this provision will help students in developing a habit of self-directed study and thereby keep abreast of the developments in their subject-matter fields and profession. Instructional and guidance personnel will be expected to promote self-directed study to help in developing this habit and an appreciation of its importance.

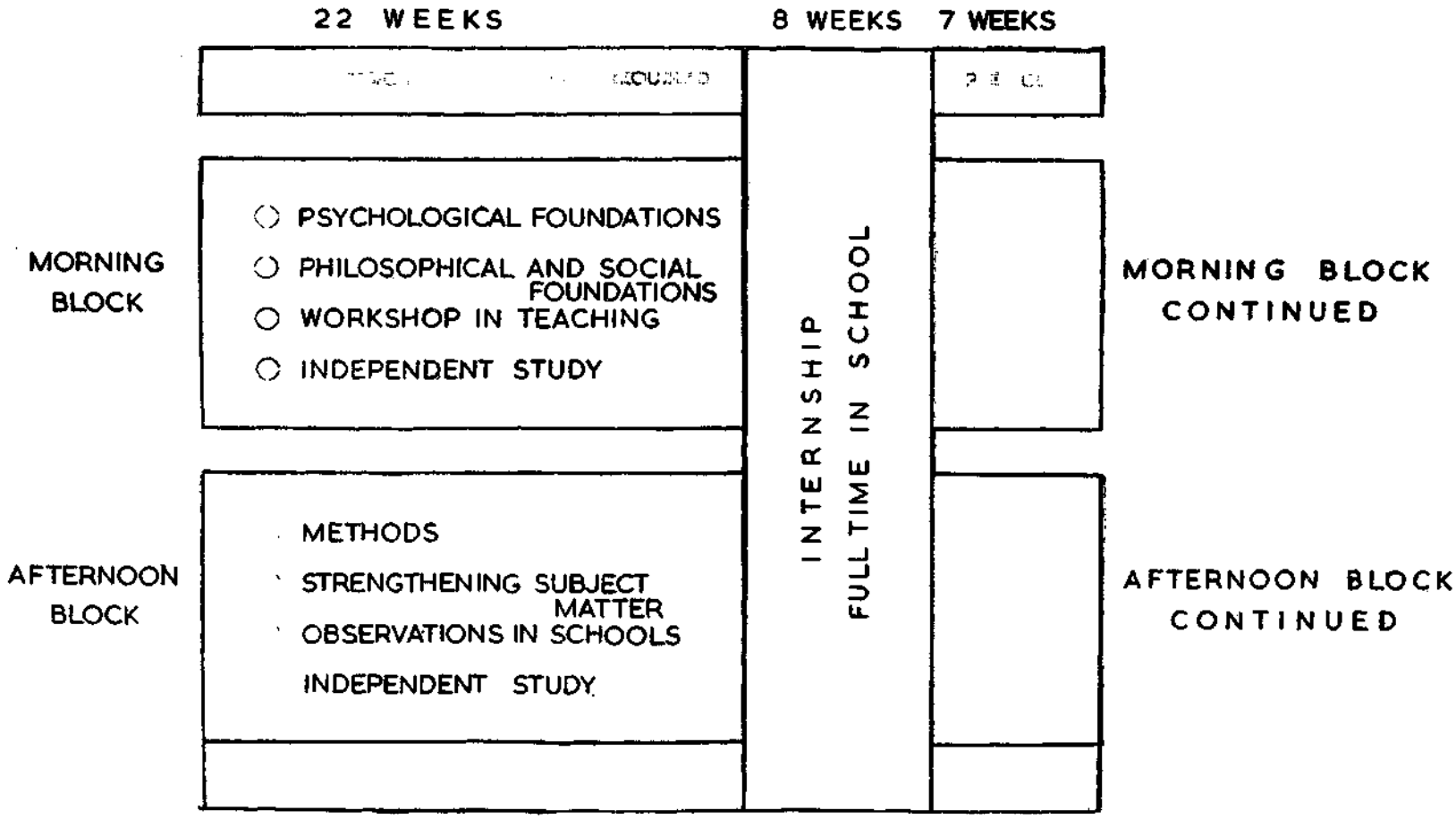
The remainder of the morning periods are devoted to instruction in three courses. These courses and the independent study time together will provide the students necessary general and professional education, independent study and also knowledge and skills which are basic to make them effective teachers and citizens. Knowledge and skills are to be developed further and applied to particular subject-matter fields in the departmental programmes in the afternoon block.

In the evening there will be recreational and cultural activities on both individual and group basis. The evening activities are designed to achieve the objectives of health, physical education and recreation as listed in the syllabus (See Syllabus, *One-Year Programme—Sequence in Health, Physical Education and Recreation, Part III*)

The evaluation of the common programme is explained in Part II.

a. The proposed time distribution for morning academic programme is shown in the diagram. The daily arrangement might be worked out in

ONE YEAR B.Ed. COURSE



several different ways.

Periods	Days				
	Mon.	Tues.	Wed.	Thurs.	Fri.
1	Psychological Foundations				
2	Social and Philosophical Foundations				
3	Workshop in Teaching			Workshop in Teaching	
4					
5	Independent Study				

(See page 35 for *Suggested daily schedule*)

b. The proposed syllabi follow.

SYLLABUS—ONE-YEAR PROGRAMME—PHILOSOPHICAL AND SOCIOLOGICAL FOUNDATIONS OF EDUCATION

6 Periods/Two Papers/200 Marks

Nature and Purpose of the Course

The purpose of this course is to give the student an integrated view of education as it affects and is affected by historical, political, economic and sociological forces. Thus the course deals with both general education and professional education. The student should be able to discern interrelationships and to formulate a philosophy of education on the foundation of related disciplines. This should help the student to discuss the educational problems intelligently, to arrive at conclusions which can be verified by the available data and to choose a practical course of action in a given situation.

Teaching Method

Lectures should be supplemented by seminars and group discussions based on wide and selected reading assignments. Written assignments by students may also be examined by the students and important points raised in the essays should be discussed in the class. Experts in related disciplines should be invited from other departments in the college or from outside to act as resource personnel at these discussions.

It may not be possible to select one text as a base. Materials and bibliography for the course will be developed in cooperation with experts. Students should be encouraged to develop their own bibliographies.

Content

SECTION A

Unit 1 Philosophy and education—their interrelationship ; meaning and functions of education ; different approaches to a philosophy of education ; idealism, realism, naturalism, instrumentalism ; Marxist and Fascist views of education ; Gandhian approach to education, democracy and educational aims ; agencies of education .

Unit 2. Education and the social order—education and economics, education and politics ; education and social institutions ; education and science ; education as an instrument of national policy ; education and values.

Unit 3. Scientific study of educational concepts and their bearing on the development of educational philosophy

Unit 4. Some outstanding educational experiments : Nursery school, Kindergarten, Montessori education, Project method and Progressive education, Dalton plan, Shantiniketan and Basic education

Unit 5. The community school : The community development programme in India, education for change and leadership, community school in other countries, role of the school in community development : philosophy and programme for a community school

SECTION B

Unit 6. A quick review of the historical background of Indian education up to 1950.

Unit 7. The development and problems of Indian education under the Five-Year Plans : education and the Constitution of India, Secondary Education Commission, expansion of educational facilities, the organizational and administrative set-up at various levels, professional and governmental agencies for promoting educational development at various levels.

Unit 8. Study of some educational problems

a. discipline and democracy
b. the concept, function and the future of public schools in India
c. the language problem
d. national and emotional integration
e. education for international understanding, selectivity in secondary education, compulsory education and its impact on further education
f. literacy in India and the world; fundamental education
g. educated unemployed
h. socio/economic status of teachers in India and abroad
i. others

Evaluation

The internal evaluation should be based primarily on assessment of (1) reading and written assignments ; (2) participation in class discussions and seminars ; and (3) ability to examine critically the written work of fellow students. A paper will be given at the end of each section.

SYLLABUS—ONE-YEAR PROGRAMME—PSYCHOLOGICAL FOUNDATIONS

5 Periods/One Paper/150 Marks

Nature and Purpose of the Course

The principles and theories of human growth and development, processes, and mental health, are fundamental tools of the teacher. The student should acquire these tools in this course. The course is designed to provide students with knowledge and concepts in psychology which will contribute to their performance as teachers.

Teaching Method

This course should be closely correlated with other professional courses and with student teaching. Psychological principles and theories which affect classroom and school organization, subject matter organization and presentation, pupil-teacher relationships, pupil-pupil relationships, evaluation of pupil abilities, interests and achievement, and pupil guidance should be dealt with in this course. The instructor of this course should possess a depth of background in both general psychology and professional education. He should be cognizant of the total professional programme and so teach that he may capitalize on the teaching-learning situation in the college and the attached demonstration school. Theories and principles should be demonstrated and illustrated by observations, experiments, and practice.

Content

Unit 1. Pychology as a discipline

a. Fields of psychology (physiological, comparative, developmental, abnormal, social, differential, applied)
b. The scientifie method as used in psychology
c. The nature of educational psychology
d. The contributions of psychology to teacher education :
   1. social psychology and mental hygiene as they apply to classroom and school organization, teacher-pupil planning, and human relations
   2. abnormal psychology as it relates to the identification of and provisions for a typical students
   3. contribution of educational psychology to teaching practices

Unit 2. Human growth and Development

a. Heredity and environment—nature and nurture in growth and development
b. Physiological and emotional bases of growth and development, maturation, and learning
c. Individual differences and how they affect teaching and learning
d. The nature and nurture of abilities and interests
e. The nature and meaning of intelligence

Unit 3. The construction and use of tests

a. Common types of tests—written, oral, performance
b. The measurement of abilities, intelligence, interests, achievement
c. Test validity and reliability
d. Elementary statistics as they relate to test construction, test improvement, and grading

Unit 4. The Nature of learning

a. Learning, retention, transfer, and application; various theories
b. Relevance of school work to adolescent needs
c. Motives and incentives
d. Discipline
e. Research on teaching-learning process : classroom dynamics, workshop method, problem-solving method, etc.

Unit 5. Psychological bases of learning by doing

a. Learning motor skills
b. Integration of theory and practice

Unit 6. Mental health in the school

a. Psychodynamics of human behaviour according to Adler, Freud, Jung and others
b. Psychological mechanisms and types of mental disorders
c. The role of educational agencies in mental health

Unit 7. Psychological foundations of creativeness

a. Principles of creativeness
b. Review of research in creativeness
c. The identification and development of talent broadly defined : academic, artistic, mechanical, athletic, etc.

Unit 8. The application of psychological theories and principles to common school problems. Samples follow, but the problems dealt with should be selected by each class and instructor

a. How to develop staff relationships that encourage good communications and cooperation

b. How to deal with problems of student discipline
c. How to provide for individual differences while making maximum group progress
d. How to make the evaluation system organic to the instructional programme
e. How to carry on pupil-teacher planning within a fixed syllabus
f. How to organize a class in order to encourage individual and group creativeness

Evaluation

Evaluation will be based on periodic written assignments and quizzes, on student participation in group discussion and on performance in identifying and proposing solutions to psychological problems. A paper will be administered at the end of the course.

SYLLABUS—ONE YEAR PROGRAMME—WORKSHOP IN TEACHING

5 Periods/One Paper/100 marks.

Nature and Purpose of the Course

This course is designed to form a connecting link between the *Integrated Common Programme of Professional Education* on one hand and the *Departmental Programmes* on the other. (This course should help the student to test and apply the theories that he has learnt in the first two courses. The emphasis in this course should be on learning by doing.)

Teaching Method

a. The course should be integrated with the other general and professional courses. Also the various units in the course should be taught in an integrated manner.

b. The course will largely be a team effort although one staff member will be responsible for continuity and evaluation. The entire staff should be drawn upon as needed, particularly, the guidance counsellor, the psychology instructor, the physical education instructor, the subject-matter specialists and the coordinator of various services, who will all be called on to help with appropriate units. Team teaching will require clearly understood statements of objectives, evaluative criteria, and continuous cooperative planning.

c. Role playing basic perceptual experiences, teaching and other instructional aids and techniques should be utilized on an experimental basis.

d. Pupil-teacher planning of the curriculum and methods should be employed systematically.

e. The course should be closely related to the *Internship in Teaching* and the work in special methods in the departmental programme.

Content

Introduction—Orientation to the educational programme of the college

a. Objectives of the college
b. Nature of the profession and professional competencies
c. The one-year programme and its interrelationships
d. The services of the college guidance programme

Unit 1. Guidance

a. Review of theory—relate the guidance theory to its bases in the *Psychological Foundations* course and to its implications for the course in *Social and Philosophical Foundations*

b. The guidance programme in a multipurpose secondary school—an investigation based on personal experience and a study of the demonstration school

c. The principles and problems of guidance :

1. Aims and philosophy
2. Evaluating the student through performance in class and co-curricular activities ; annecdotal and cumulative records; autobiography and essays ; sociograms ; career reports and observational techniques
3. Educational and occupational information
4. Group guidance techniques
5. Understanding the role of the counsellor and other specialists
6. Guidance through curricular subjects, books and hobbies
7. Assisting students with educational and vocational planning (explanation of the role of the career master, etc.)
8. Teaching and guiding the exceptional student (gifted, retarded, handicapped)
9. Teachers role in guidance job, placement and follow up
10. Home room guidance programmes
11. Principles of parent-teacher participation
12. Skill development in analyzing data, practice in counselling, helping to plan and execute a group guidance activity, etc.
13. Cooperation with departmental programmes

Unit 2. School organization

a. Review of theory—what is school organization ?

b. The community school theory and practice

c. Principles of school organization as practised in the college and the demonstration school

d. Skill development in organizing a multipurpose secondary school-a critique of the organization of the demonstration school followed by the development of alternative plans of organization

Unit 3. Health and human relations

a. Review of theory—See the objectives in the syllabus *for the Sequence of Health, Physical Education and Recreation*

b. Principles of health, physical education, recreation, and human relations

1. Modern principles, aims and objectives of physical education including a general survey of the past and present trends in physical education
2. Rudimentary knowledge of human physiology
3. Organization and administration of health education, health examination, school health services
4. Athletics and sports ; their organisation and conduct
5. Recreation ; play activities for different age-groups
6. Equipment and facilities
7. Scouting and Guiding
8. Personal and social aspects of health education and human relations
9. Common ailments and physical defects of children
10. Condition of healthy physical life in schools
11. Nutrition and school meals
12. Safety education and first aid
13. Sex education
14. The role of the classroom teacher
    a. observations of learners
    b. meeting learning needs
    c. function and responsibilities of teachers with reference to health status, disease, and physical defects
    d. maintaining a healthful environment in classroom and school

c. Skill development:
    1. In planning and directing activities in health either in the demonstration school or the college
    2. In planning teaching procedures to bring about better human relations in the hostels and in college classes and college life as a whole

Unit 4. Evaluation

a. Review of theory
b. A study of the various methods of evaluation in the demonstration school
c. Principles and practices of evaluation
d. Psychometrics with a view of understanding concepts like mean, mode, standard deviation, correlation and standard scores use of standardized tests

e. Skill development in :
   1. Using standardized tests
   2. Constructing and using teacher observation schedules and tests

Unit 5. Curriculum planning and teacher-pupil planning

a. Review of theory
b. An investigation of curriculum development and of the uses of teacher-pupil planning in the demonstration school
c. Principles and practices in curriculum development and teacher-pupil planning
d. Skill development through
   1. Planning the curriculum of a projected multipurpose school
   2. Helping to plan a unit of instruction for the demonstration school
   3. Practising teacher-pupil planning in the course *Workshop in Teaching*. This cooperative planning should extent from the beginning to the end of the course including evaluation
   4. Working with one *Departmental Programme* on curriculum and teacher-pupil planning. (This should be a joint effort.)

REFERENCE

Parrish, Louise and Waskin, Yvonne, *Teacher-Pupil Planning for Better Classroom Learning*, Harper & Brothers, 49 East 33rd Street, New York 16. N. Y., 1958 Edition.

Evaluation

Evaluation should be planned with students and handled on a laboratory basis as indicated in Unit 4. Terminal evaluation should deal with group and individual solutions of selected problems, real or simula, ted such as those in the field of guidance :

a. Outlining a guidance programme to accompany a given stream in the school programme
b. Identifying the steps to be taken in helping a seriously maladjusted student in a multipurpose school
c. Revising a given group guidance syllabus

SYLLABUS—ONE-YEAR PROGRAMME—HEALTH, PHYSICAL EDUCATION AND RECREATION

5 Periods/No Paper/50 marks

Nature and Role of the Course

The course in health, physical education and recreation is based on the philosophy of general education, but it has also certain content which contributes very directly to professional competence. First aid instruction, leadership, education assuming responsibility and leadership, personality development through participation in activities and the informal recreational programmes are of inestimable professional value,

The related course *Workshop in Teaching* contains a major professional unit dealing with health and human relations.

Objectives of the Course

1. To develop useful and fundamental physical skills :
   (a) living safely and successfully—skills, such as, walking, dodging, lifting, running, jumping, throwing, climbing
   (b) participation in value individual, dual and team sports, rhythemics
2. To establish, maintain and improve physical fitness and body development—strength, agility, flexibility, balance, coordination, endurance
3. To offer opportunities for recreational pursuits, such as gardening, nature study, etc.
4. To appreciate sports as a participant and spectator by learning rules, scoring and strategy involved in the activities.
5. To help the individual to understand and make the best use of his potentialities and to provide opportunities for self expression and creative abilities.
6. To develop the skills of listening to observing and following direction : air craft observation—particulary acting as watch and ward.
7. To establish, develop, maintain and improve good attitudes towards :
   a. personal health
   b. mental health
   c. family living
   d. community health

e. safety in the home, school, community and at work
f. first aid
g. growth and development
h. effects of alcohol, tobbaco and drugs
i. nutrition

8. To develop desirable leadership, character, social traits and attitudes which are essential to effective democratic living by :
   a. getting along with others
   b. exhibiting good sportsmanship—humility in victory, graciousness in defeat
   c. loyalty to team or group
   d. competitive spirit
   e. appreciation of a good performance by others
   f. initiative
   g. courtesy on and off the court
   h. ability to adapt to changing conditions
   i. self-confidence, self-control and emotional stability
   j. cooperation
9. To develop the power to think clearly, logically, honestly and critically, and to make decisions with courage after careful evaluation.
10. To develop as a part of the concept of total fitness an understanding of the interrelationship between physical, mental and emotional health.
11. To provide a wholesome and disciplined outlet for release of tensions and pent-up emotions, and the development of a style of relaxation.
12. To develop an understanding of the way in which scientific knowledge contributes to better health.
13. To recognize health improvement as a world problem and to encourage support of world-wide scientific and humanitarian efforts and organizations.
14. To encourage the individual to appreciate, utilize and support the work and services of local and state departments and volunteer organization concerned with health and safety.

Teaching Method

This course is designed to cover objectives related to physical health but it is primarily concerned with the other objectives of health and recreation. The first aid instruction will be based on the programme outlined by the St. John's Ambulance Unit. The school physician will help the departmental personnel with the instruction. Personal health, sex education, nutrition and utilization of health services can be taught with the help of the school physician. Rifle practice can be worked out with the help of local rifle

club. Scouting and guiding can be carried out with the help of resource personnel in the community.

The more specialized games must be taught by departmental personnel but many games can well be taught by student leaders. The broad cultural activities may be taught by student leaders and interested staff members.

The biological and psychological basis of health and growth are taught in related courses and this background should be utilized.

The course will provide adequate flexibility to meet individual needs. Continuous evaluation and cooperative planning will be required to collect individual needs and to bring out professional implications. In some cases students can fit into activities and units offered for students in the four-year programme. Guidance counsellors and the physical education staff should work together to ascertian student needs and plan programmes accordingly. Efforts should be made to prepare students to be effective participants in the health and recreational programmes in multipurpose secondary schools.

Content

Unit 1. First Aid

This unit should be completed early in the course.

Unit 2. Personal Health

a. Evaluation and interpretation of health data concerning self.
b. Sex education
c. Utilization of health services
d. Nutrition

Unit 3. Games and Recreation

Orientation and instructions in rules and activities should be handled by specialists.

Each student should attain efficiency in atleast five games, two of which should be major. The activities of this unit should continue throughout the year.

Major Games : Cricket, hockey, football, volleyball, basketball, throwball, netball, badminton, tenniquoit tennis, table tennis, and other games according to the playground facilities.

Activities : Athletics, swimming, gymnastics, intramural competitions, periodical physical fitness test practical meets, scouting and guiding, rifle training, archery, folk dances and cultural activities of many kinds.

Unit 4. Leadership

This unit will be taught to all students as they show a readiness for it. The elements will be as follows

a. Concept of leadership in a free society
b. Role of leadership in a free society
c. Learning to give leadership to the activities in the course
d. Applying learning to the secondary school situation

Evaluation

Evaluation in first aid will be according to the standards of the St. John's Ambulance Unit.

The internal assessment in the course in health, physical education and recreation will be based on all of the objectives of the sequence. Special assessing schemes should be developed to measure readiness and completion, e.g. readiness to take the leadership unit and completion of various efforts.

Departmental Programmes

All general professional courses will be offered in the morning. The afternoon session will be reserved for instruction in science, agriculture, commerce, fine arts, home science ond technology education. Students will study and do practical work in the methods of teaching and in the subject matter of their respective fields. The afternoon session will build upon and make specific application of the content of the morning programme.

Each departmental programme will offer study in the special methods of that subject. Incorporated in this study will be observation of classwork in the demonstration school and in other local schools.

Inter-Departmental Teamwork in Audio-Visual Education

All of the departmental programmes provide for teaching about the selection, preparation and use of instructional materials. The plan calls for a special cooperative effort in the field of audio-visual education. It is assumed that all departments will cooperate in teaching the unit on audio-visual equipment and materials including the selection, preparation and use.

Cooperative planning is essential in dealing with the unit. There could be some large-group instruction in using audio-visual materials. This instruction should deal with philosophy principles and basic research findings and the practical applications. Instructors in the forenoon programme especially those teaching *Workshop in Teaching* should be associated in teaching this unit. A period of about a week should be set aside for this cooperative unit.

Methods and Teaching Practice

Prior to the eight-week period of internship in teaching, each student will participate in the classrooms, shops and laboratories of the demonstration school on a gradually increasing scale. Carefully planned lessons will be taught under supervision.

Internship in teaching will begin for half of the students of the college after approximately 14 weeks of instruction. It will extend over a period of eight weeks. The second half of the student body will be sent for internship on the return of the first group. Students will be assigned to schools in the various states and territories served by the Regional Colleges of Education. The student's facility in a language will be a factor in placing him for his internship experience.

After internship, each student will continue his studies on selected topics related to the internship experience. This post-internship study will capitalize on the field experience to remove the weaknesses revealed in actual practice.

Subject Matter and Independent Study

Provision will be made in the afternoon depertmental block-of-time for the study of subject matter. This subject matter study will be individualized to meet the special needs of each student.

The time table should provide time for independent study, whenever, necessary.

Integrated Teaching of Subject Matter and Method

Subject matter has been included in all the one-year programmes to bring content knowledge up to date and to fill in the gaps in a rather specialised first degree. Teaching in the secondary school often demands a broad background of general science.

The entire afternoon programme is an integrated approach to content, method and internship. It presents a favourable arrangement to show the relationship that exists between method and subject matter. With a staff competent in method and subject matter and with an ample block-of-time, it should be possible to closely relate subject matter and teaching method in this programme.

Evaluation in Departmental Programmes

The evaluation in the departmental programmes should be carefully planned. While the method of teaching are subjcet to external evaluation, content and internship are largely assessed internally but this is subject to new defications that may be suggested by the respective universities.

SYLLABUS—ONE-YEAR PROGRAMME—BLOCK-OF-TIME
FOR AGRICULTURE

Nature and Purpose of the Programme

The purpose of this departmental programme is to produce a teacher who will be :

1. Liberally educated to fulfil his role as a citizen in a domocracy
   A teacher of agriculture will be involved very directly in all aspects of community life. To be effective, he must, first, be aware of problems of the community and the concerns of its people and, secondly, he must be able to provide leadership in the democratic solution of community problems.
2. Competent to represent the educational profession and his subject-matter field in the school and community

   Instruction in agriculture to be effective must be based on community needs on sound educational principles, and on technical information that is complete, correct and up to date. Teachers of agriculture then should be sound educators contributing both to general educational objectives and to the special objectives of agricultural education.
3. Thoroughly grounded in both the theory and practice of his subject matter and possessed of the knowledge and skills necessary for teaching theory and practice in an integrated manner

   Vocational preparation through instruction in agriculture is largely wasted unless changes in agricultural practices are implemented. It follows that the teacher of agriculture must be thoroughly grounded in the principles of agriculture and skilled in farm practices.
4. Able to contrive and use a variety of effective teaching-learning procedures

   Since agricultural education covers a broad field of human activity, the teacher of agriculture must be very skillful in investing, using and adapting teaching-learning procedures of an academic nature or procedures to be used in the laboratory and on the farm.

5. Able to develop and use instructional materials including audio-visual materials

Instructional materials for the field of agriculture must continuosly be under appraisal and revision. New materials must be developed. Therefore, it is essential that teachers of agriculture should be competent to appraise, adapt, revise and create specialised materials.

6. Able to select and organize subject-matter for instructional purposes

The teacher of agriculture should be able to select those facts and principles which are most appropriate to effective instruction in agriculture. Planning for teaching also includes designing-learning experiences which are applicable to problem-solving situations based upon actual farming problems of students

7. Able to use a variety of methods to evaluate pupil progress and his own growth as a teacher

Teachers of agriculture must be able to evaluate pupil progress in order to plan and adjust the instructional programme. This implies mastery of a combination of evaluation techniques including written assignments, examinations, problem-solving experiences, and observations of pupil behaviour.

8. Capable of recognising individual needs of students and creating teaching-learning situations based on indivisual needs

The basis for much instruction in agriculture grows out of occupational experiences of students. Ability to recognise individual needs, rates of growth and learning problems is essential in agriculture as is the ability to apply the principles of learning to individual or group instruction.

9. Able to select and use appropriate equipment and determine supply need

10. Able to function effectively in the guidance programme of the school

The teacher of agriculture should understand the school guidance programme, participate in it and provide guidance to his own students. He should be especially responsible for information about career opportunities in his field.

11. Capable of organizing and supervising co-curricular activities

In addition to the ability to participate in all-school co-curricular activities, the teacher of agriculture should be able to organize and give leadership to the youth organizations peculiar to his field.

12. Capable of functioning effectively as a teacher as evidenced by actual classroom performance

    In agriculture, the classroom includes the laboratory, workshop, school farm, home farms of students and the school community. Teachers should demonstrate competency in all these settings as each plays a vital role in the total programme.

13. Proud of his profession and interested in continued growth through participation in professional associations, community leadership activities, inservice education, research and experimentation

    The long-range success of a teacher of agriculture depends to a large measure upon his ability and willingness to continue his professional advancement. Improvement should occur in regard to both technical agriculture and professional education.

Nature of Student Personnel

The programme in agricultural education will be based in part upon the following general assumptions regarding students:

1. Students will have completed a B.Sc., in agriculture in a recognised college of agriculture.
2. Students will possess varying degrees of teaching experience, background of farming experiences and proficiency in farming skills.
3. Students will generally lack proficiency in agricultural engineering technology, in the ability to relate classroom instruction to actual farming operations and in the field of school and community relationships.

Teaching Methods

Although some flexibility will be permitted in the arrangement of experiences, it is proposed that the block-of-time allotted for agricultural education should be organized under three headings; (1) methods of teaching, (2) individual effort, and (3) proficiency in agriculture.

Methods of Teaching Agricuiture

This part of the programme will require about five periods per week throughout the academic year, except for the practice teaching time. A combination of discussions, lectures, observations, individual and group projects, and individual study will be featured. Departmental personnel will be responsible for organizing and conducting the experiences utilizing resources from other departments of the Regional College, the demonstration school, and the surrounding community.

Individual Projects

Individual experimences will be planned for about five periods per week. In order to provide guidance and direction to students, each will be assigned to a member of the staff in the department of agriculture. Students will confer with their advisers periodically, individually and in small groups. Projects, areas of study, needed competencies will be identified by each student and his adviser, based upon a personal inventory. Students will proceed with experiences, under such supervision as is deemed necessary. Following the completion of each experience, students will again confer with their advisers for the purposes of evaluation and forward planning.

Development of Proficiency in Subject Matter

This part of the programme in agricultural education is aimed at the development of proficiency in a wide range of farming skills and abilities. The major emphasis will be placed upon those competencies which are needed by all students. Some time will also be devoted to strengthening competencies of small groups or individuals. Instruction will be largely in terms of individual study, demonstration and individual practice. Approximately, ten periods per week will be allotted to this part of the programme.

Content

METHODS OF TEACHING AGRICULTURE

Unit 1. History and development of agricultural education in India and other countries : nature, extent and appraisal of programmes—extension service

Unit 2. The role of agriculture in the multipurpose school : college preparatory, employment preparatory

Unit 3. The role of the teacher of agriculture in relation to teaching agriculture : the total programme of the school, participation in community and agency activities

Unit 4. Qualifications of the teacher of agriculture

Unit 5. Guiding principles for effective instruction in agriculture

Unit 6. Teaching methods in agriculture as related to the secondary school syllabus

Unit 7. Classroom organization for instruction in agriculture

Unit 8. Planning a secondary school programme of agriculture based upon community needs and study of existing syllabus

Unit 9. Preparing lesson plans for teaching

Unit 10. Teacher-pupil planning

Unit 11. Planning, conducting and evaluating occupational experiences of students

Unit 12. Evaluating student progress in general

Uuit 13. Planning and management of facilities and equipment for instruction in agriculture, including school farm

Unit 14. Organization of youth activities

Unit 15. Adult education in agriculture : purpose, methods, techniques of instruction

Unit 16. General school activities

Unit 17. Guidance

Unit 18. Observing learners, classes and schools and preparing for student field experiences

Unit 19. Selecting, preparing and using instructional including text book materials including audio-visual materials :
This unit will stress specimen collection along with methods of treating, storing and using specimens. Audio-visual materials will be dealt with cooperatively in the inter-departmental unit

Subject Matter

Unit 1. Livestock production : selecting suitable breeding stock ; selecting and preparing feeds ; preparing balanced rations ; treating for diseases and parasites ; general management and care of livestock ; processing livestock products and marketing

Unit 2. Crops : selecting fields for crops; preparing seedbeds; selecting suitable seed varieties ; fertilising crops; planting crops ; controlling weeds, insects and diseases ; pruning, grafting and transplanting ; harvesting and storing crops ; processing crops and marketing crop products

Unit 3. Farm engineering technology : Farm power and machinery—adjustment, maintenance and repair ; farm buildings, and conveniences—concrete, plumbing ; fencing, roofing, general construction ; soil and water management—land classification, drainage, irrigation, soil and water conservation practices; rural electrification—wiring, motors and farm carpentry and metal structures—woodworking, tool fitting, soldering and sheet metal welding

Unit 4. Agricultural economics and rural sociology : Inventorying land resources ; planning the cropping system ; planning the livestock system ; planning the labour requirements ; farm accounting and record keeping ; farm credit ; farm insurance ; marketing ; government farm legislation and agricultural agencies

Evaluation

Evaluation in agricultural education will seek to determine student progress and achievement as well as to evaluate the effectiveness of the programme as taught. A variety of techniques should be employed such as participation in class discussions, observations of student behaviour, written examinations and performance tests based on unit and general objectives. Evaluations of student progress should be based dircetly on the competencies as outlined. Evaluations of the scheme in operation should be based on both plan and the specific methods employed.

SYLLABUS—ONE-YEAR PROGRAMME—BLOCK-OF-TIME FOR COMMERCE

Nature and Purpose of the Programme

The departmental programme is based on the following assumptions :

1. That the students will divide into two groups. One group will be qualified in the non-stenographic areas of commerce and the other group will be qualified in the stenographic areas.
2. That initially most of the students will have had some teaching experience.
3. That most of the students in the non-stenographic areas will enter the programme with a M. Com. degree and/or a B. Com. degree.
4. That those students who enter with a M. Com. degree will have no significant subject-matter deficiencies but will not be familiar with the commerce courses in the secondray schools.
5. That all students will profit from a brief review of the content of the higher secondary school commerce courses.
6. That the stenographic students will have a B. Com. degree and a diploma in shorthand and typewriting. Few will have a M. Com. degree.
7. That most stenographic students will need to improve their typewriting, shorthand, transcription, and skills and knowledge pertaining to office procedure.
8. That some non-stenographic students may wish to develop an initial skill in the area of shorthand and typewriting.
9. That all students will need to develop familiarity with the newer office-machines.
10. That all commerce students could profit from continued discussion of basic economic problems and their implications.

Purposes of the Programme

The purposes of the programme may be obtained by listing the desired competencies of a teacher and identifying the implications of these competencies for the training of a commerce teacher. The prospective teacher of commerce should be :

1. Liberally educated to fulfil his role as a citizen in a democracy
   The commerce teacher should develop an understanding of current economic problems that affect everyone. As a teacher and leader in a commnnity, he should understand the differences among social and economics systems. The relationship of theoretical economics to personal economic problems is not always understood by students. The commerce teacher in the multipurpose school will be concerned primarily with personal economics, that is, how to manage one's income, savings and investments, borrowing money, taxes, economic problems presented to voters, and so forth.
2. Competent to represent the education profession and his subject-matter field in the school and in the community
   In addition to the learnings common to all teachers the commerce teacher should be informed of the history of commerce education in India, types of institutions providing commerce education, objective of the commerce stream in the multipurpose school, and relationships of the commerce stream to the other streams in the school. He should also be aware of the major issues and problems in the further development of commerce education in India.
3. Thoroughly grounded in both the theory and practice of his subject matter and possessed of the knowledge and skills necessary for teaching theory and practice in an integrated manner
   One of the basic assumptions presented in this section is that the commerce students would enter the college with a good background in the basic subject matter. The colleges, therefore, will not be required to provide instruction in basic subject courses such as accounting, economics, economic geography, business correspondence, banking, and so forth. However, it will be necessary :
   a. to review those elements of subject matter that are included in the higher secondary school syllabus in which the student is deficient ;
   b. to stimulate student to continue his interest in further inquiry into the areas of economics and commerce ;
   c. to provide a planned programme of instruction on those business machines which may be taught in the multipurpose school and on which the student will have had no training ;
   d. to provide a planned programme of instruction to advance the students's skills in typewriting, shorthand, and transcription. If an adequate number of teachers with a background in shorthand and typewriting are not recruitable, the colleges will need to provide beginning instruction in these skills.

4. Able to contrive and use a variety of effective teaching-learning procedures

   The commerce teacher should be trained in the use of a variety of instructional techniques, such as, committee work, question and answer, demonstration project and discussion. He should also be able to develop, construct and use a wide variety of teaching aids. In addition to understanding the psychological principles common to all learning, the commerce teacher must understand thoroughly the psychology of skill building, basic factors in skill development and learning difficulties peculiar to commerce courses.

5. Able to develop and use instructional materials including audio-visual materials

   The commerce teacher should be in a position to use different audio-visual materials to make his instruction more effective and meaningful. He should also know how to prepare the students for receiving the maximum benefit of such aids. He should be able to prepare simple and inexpensive charts and models to make his instruction more effective.

   The commerce teacher will be required to prepare job instruction sheets for use in typewriting, bookkeeping, and other subject. To do this, he must be able to express himself in good written form and be qualified to prepare materials which will enrich the subject for superior students and reinforce the learning for the slower students.

6. Able to select and organize subject matter for instructional purposes.

   The commerce teacher should appreciate the value of learning about the business occupations in the area served by the school. He should be able also to plan ways of (a) enriching syllabi, (b) adapting the programme to the community needs, (c) providing a sound background for those students who continue on to college, (d) identifying sources of supplementary teaching and learning materials and, (e) preparing good lesson plans designed to develop knowledges, understandings, skills and attitudes for a wide range of student abilities.

7. Able to use a variety of methods to evaluate pupil progress and his own growth as a teacher.

   The commerce teacher needs to understand the values and limitations of various methods of evaluating student progress. This would include (a) understanding values and limitations of various types of tests, (b) knowing how to prepare, administer, improve and refine teacher-made tests and, (c) knowing how to utilize test results as a

basis for remedial teaching. In addition the commerce teacher must understand testing as it relates to skill development and how to use tests, progress charts, and rating scales to evaluate skill performance.

8. Capable of recognizing individual needs of students and recreating teaching-learning situations based on individual needs

In a typical commerce class the students present a wide range of physical and mental abilities, student expectations and home environments. The commerce teacher must be aware of these difference and understand how to use cumulative records, guidance data, and test individual difference. The commerce teacher must also recognize the desirability of adapting the instruction to the learning level of each student, and be able to contribute to the development of good study habits.

9. Able to select and use appropriate equipment and supply needs

The commerce teacher should be familiar with the types of office machines currently used in business and be able to operate efficiently those machines on which instruction is given in the school. He should also be familiar with reference books, general and commercial education periodicals.

10. Able to function effectively in the guidance programme of the school

The commerce teacher should be able to

a. discuss the vocational implications of the commerce programme and interpret the job situation to students and to parents,
b. prepare informational materials on the objectives of the commerce programme which will have meaning to pupils and parents,
c. contribute to the cumulative records maintained by the school,
d. interpret the role of the classroom teacher in the placement programme of the school.

11. Capable of organizing and supervising co-curricular activities

The commerce teacher should recognize the importance of co-curricular activities to the total educational programme of the school and have skill in organizing and managing such activities as clubs, field trips, cooperative stores, cooperative banks, surveys of former students, school publications, exhibitions and simple economic surveys.

12. Capable of functioning effectively as a teacher as evidenced by actual classroom performance

The college programme should be so planned as to provide the following types of classroom experiences

a. instruction in techniques of observation developed by a series of demonstration lessons given by the lecturer on method.

b. observations of commerce classes as well as non-commerce classes,

c. participation in the life of a school prior to assuming teaching responsibilities. The length of the period of participation should be adjusted in terms of the background and teaching experience of the student,

d. student teaching and periodic evaluation.

13. Proud of his profession and interested in continued growth through participation in professional associations, community leadership activities, inservice education research and experimentation

Fulfilment of this competency would require the commerce teacher to be (a) familiar with professional associations and organizations, and (b) interested in participating in small conferences and study groups, reading professional literature and conducting classroom research.

Teaching Method

Because of their special areas of preparation and the subject which they will be qualified to teach in the multipurpose school, the commerce students will be divided into two groups ; stenographic group and bookkeeping economics group.

The stenographic group (a minimum of twelve students) will be those teachers now teaching or preparing to teach shorthand, typewriting, transcription, office practice, and business correspondence.

The bookkeeping economics group will be those teachers now or preparing to teach bookkeeping elements of commerce, economics and economic geography.

Much of the content and experiences of the departmental programme will be common for both groups. Some parts of the programme, however, will have implications which will differ between the two groups. For those parts, the students will be divided into two groups each studying and discussing the implications of the general topics to their special interests.

The block-of-time in the afternoon from 1 : 20 p.m. to 4 : 40 p.m. will allow four teaching periods daily, a total of 20 teaching periods a week (five-day week). The 20 periods should be thought of as representing a block-of-time in which the following activities would take place :

a. Discussion of teaching methods

b. Review of subject matter and the development of new understandings of broad economic problems

c. Development of skill on office machines

d. Observations of teaching schools, and field trips to business and industry

e. Improvement of special skills (for some students only)

Any rigid compartmentalization of these various activities into specific periods per week would depreciate the values which could accrue from the planning for the afternoon block-of-time. The following allotment merely suggests in approximate measure of how the time may be distributed :

1.	Methods of teaching commerce subjects : observations of teaching and appropriate participation in the classroom	
2.	Skill building and subject matter review : skill building in typewriting, shorthand, transcription, business English, and speech	
	OR	
	Review of commerce, economics, economic geography, accountancy, and speech	6
3.	Development of skill on office machines	2
4.	Study of current economic problems	2
	Total	20

Content

METHODS OF TEACHING COMMERCE

Unit 1. Development, status, and objectives of commerce education in the secondary school

a. Growth and present status of commerce education in the secondary school

b. Major objectives of the commerce programme in the multipurpose school

c. The content and organization of the multipurpose school commerce course

d. Relation of commerce programme to other subjects in the curriculum

e. Competencies desired of students passing out of the multipurpose school commerce stream

BOOKKEEPING-ECONOMICS STUDENTS : the objectives of bookkeeping, elements of commerce, economics and economic geography in the secondary school.

STENOGRAPHIC STUDENTS : the objectives of typewriting, shorthand transcription and office practice in the secondary school.

Unit 2. Instructional facilities and materials required for the commerce programme

a. The importance of proper equipment and materials for effective instruction and classroom management

b. Criteria for selection of textbooks, reference books, journals and other publications

c. Criteria for selection of other instructional materials

d. Cooperating with the inter-departmental unit on audio-visual materials. A period of about one week is allowed for the joint planning and execution of this unit.

BOOKKEEPING-ECONOMICS STUDENTS

1. Room and eqipment requirements for instruction in bookkeeping, economics, economic geography and elements of commerce
2. Textbooks and materials needed for bookkeeping, economics, economic geography, and elements of commerce

STENOGRAPHIC STUDENTS

1. Room and equipment required for instruction in shorthand, typewriting, transcription and office practice
2. Texbooks and materials needed for shorthand, typewriting, transcription and office practice

Unit 3. Selection and Organization of Subject Matter

BOOKKEEPING-ECONOMICS STUDENTS

1. Analysis of the multipurpose school syllabi in bookkeeping, elements of commerce, economics and economic geography
2. Over-lapping and interrelationships of the course content in the various subjects
3. Evaluation of the course content in relation to the course objectives
4. Methods of organizing the content for teaching

STENOGRAPHIC STUDENTS

1. Analysis of the multipurpose school syllabi in shorthand, typewriting, transcription and office practice
2. Evaluation of the course content in relation to the course objectives
3. Correlation of the skills and knowledge between courses
4. Methods of organizing the content for teaching

Unit 4. Basic principles and practices in teaching commerce courses

a. Critical analysis of methods of teaching commerce courses:
Lecture method

Assignment-study-recitation method
Discussion method
Project method
Problem solving method
Unit method
Resource unit

b. Student-teacher planning in commerce courses

c. Analysis of learning experiences which may be used in commerce courses : direct purposeful experiences, contrived experiences, dramatized experiences, demonstrations, field trips, exhibits, films and slides, visaul symbols

d. Identifying and using community resources

BOOKKEEPING-ECONOMICS STUDENTS

Methods of teaching bookkeeping : introducing the bookkeeping course ; teaching journals and ledgers, the trial balance, final accounts, closing entries, special journals, self-balancing systems, adjusting entries and opening entries, using and designing teaching aids and devices, planning and making assignments

Methods of teaching elements of commerce, economics, and economic geography :

1. Motivation
2. Selection of content : units, topics, instructional material sources, projects, student-teacher planning
3. Analysis of previous learnings, constructing appropriate pre-tests
4. Learning activities : demonstration, discussions, field trips, group activities, teaching aids, readings
5. Assignments, notebooks, study outlines, term papers, projects, readings
6. Evaluation, remedial teaching, final evaluation

STENOGRAPHIC STUDENTS

a. Principles of skill building

b. Analysis of teaching aids and devices in skill building courses : demonstrations, instructional materials, using the black-board, using the bulletin board and construction and use of individual student progress charts

c. Teaching of typewriting : developing correct stroking habits, teaching figures and special characters, building manipulative skills, increasing speed, developing accuracy, proof-reading and correction techniques, using the typewriter for centring and tabulating,

letter writing, manuscript writing, machine composition, testing in typewriting, straight-copy test, production test

d. Teaching Shorthand
   1. Developing correct study habits for learning shorthand
   2. Presenting new material through the black-board
   3. Reading connected matter
   4. How to introduce writing
   5. Teaching penmanship
   6. Giving dictation, counting and timing dictation materials, using prepared tapes and records, preparing dictation tapes
   7. Organizing the class to provide small group dictation and practice
   8. Testing in shorthand

e. Teaching transcription : introducing transcription, drills for building transcription speed, drills for improving transcription quality, developing time saving office techniques, introductional materials and facilities required for teaching transcription

Unit 5. Evaluation of Student Achievement

a. Standards of achievement
b. Need for standards for guidance purposes, for grading purpose, for placement purposes
c. How to determine job standards
d. Status of aptitudes and prognostic tests in commerce subjects
e. Role of the teacher in evaluating students
f. Criteria for evaluating a commerce programme in a school

BOOKKEEPING-ECONOMICS STUDENTS

a. Standards of achievements in bookkeeping
b. Types of tests for measuring achievement in elements of commerce bookkeeping, economics, and ecnomic georaphy
c. Grading and recording tests results
d. Using tests results as a basis for remedial instruction
e. A recommended testing programme for bookkeeping, economics, economic geography, and elements of commerce

STENOGRAPHIC STUDENTS

a. Standards of achievement in typewriting, shorthand, and transcription
b. Types of tests for measuring achievements in typewriting, shorthand, transcription

c. Grading and recording tests results
d. Using tests as basis for remedial instruction
e. A recommended testing programme for : typewriting, shorthand, transcription and business correspondence

Unit 6. Guidance and Placement
a. The importance of a guidance programme to commerce education
b. The role of the commerce teacher in (a) the total guidance programme ; (b) the guidance programme in the commerce area
c. Sources of guidance information appropriate for commerce courses : community job-surveys, follow-up surveys of former students
d. Responsibility of the school for placement of students
e. A suggested guidance programme in commerce

Unit 7. Commerce Teacher
a. Desirable qualities of a commerce teacher
b. Opportunities for professional growth

Unit 8. Co-curricular activities
a. Principles of organizing and conducting co-curricular activities
b. Clubs and projects appropriate for commerce students : how to organize and promote, how to evaluate student participation

SKILL BUILDING AND SUBJECT MATTER REVIEW

Unit 1. Status Inventory

It is recommended that a battery of tests be developed and administered at the beginning of the year. The scope of these tests should be comparable to the terminal examination given in the higher secondary courses. The intent of the examinations is to identify individual deficiencies, to determine areas of special study for each student.

For bookkeeping-economics group—comprehensive examinations over the syllabus in the following courses : bookkeeping, elements of commerce, economics, economic geography, office practice, speech

For stenographic group : examination of skills and knowledge in shorthand, typewriting, transcription, business English and correspondence, and speech

Unit 2. Subject Matter Review

The deficiencies in the subject areas can be made up in different ways, such as ;

a. the students can be put in smaller groups according to subject areas and tutorial meetings may be arranged under the guidance of a staff member,

b. bibliographies of selected references can be prepared and distributed to the students for their self-study,

c. assignments can be designed and students may be asked to submit certain term papers,

d. guest speaker can be invited to talk to the students and discuss different issues,

e. field trips and excursions may be organized to give the students first-hand knowledge in specific areas.

Unit 3. Practice in Office Machines

All commerce teachers should be able to operate those office machines on which instruction must be given in schools. They must also understand how to organize equipment and instruction thereon. As the number of adding machines, calculating machines, duplicating machine and filing equipment kits will be limited in number, the students will be asked to use these machines in a rotation plan

Unit 4. Current Economic Problems

It is highly desirable that all commerce teachers possess a broad understanding of various aspects of our economic life. The purpose of this unit is to make them aware of national economic problems and their implications. Lectures, seminars, and group discussions will be used in teaching.

The following topics are only suggestive :

1. Economic planning and our Five Year Plans
2. Government's industrial policy—financing of industrial programmes (public and private)
3. Developments in irrigation and power supply
4. Population and employment
5. Village and small scale industries
6. Agricultural and industrial labour
7. Community development—Panchayati Raj
8. Social Welfare—prohibition
9. Banking Act—main features
10. Joint Stock Company organisation and Company Act
11. Foreign exchange and control

Evaluation

The objective of an evaluation programmes should be to ascertain to what extent a student has acquired the knowledge, skills and attitudes that have been accepted as desirable competencies for a commeree teacher. It is of utmost importance that all evaluation programmes be built around the desired outcomes of a course and that instruments for evaluation are developed to measure the extent to which the objectives are achieved.

Different evaluative devices should be used for this purpose, e.g. tests, rating scales, interviews, observations, questionnaries, performances, and empirical judgments. Evaluation to be effective should be a continuous process and all records of evaluation should be maintained carefully in the form of cumulative records. Tests should motivate learning, determine class progress, isolate individual learning difficulties, provide guidance data, aid in supervision and certify student competency.

Assessment of student achievement should spread throughout the year and the final grade should be awarded on the basis of all sessional work and terminal examination.

SYLLABUS—ONE-YEAR PROGRAMME—BLOCK-OF-TIME
FOR FINE ARTS (VISUAL ARTS)

Nature and Purpose of the Programme

The afternoon block-of-time will provide specialized professional education and additional work in subject matter for teachers of the visual arts. This instruction is designed to strengthen and extend the general content covered in the morning session. Topics on methods of teaching visual arts will be supplemented by observations and participation in the demonstration school and other schools in the community. Subject matter will be strengthened by special class and studio work.

The following assumptions are made regarding the students preparing to be teachers of fine arts :

a. students will have earned a five-year National Diploma in Fine Arts or an equivalent degree or diploma,

b. students will have sufficient command of the English language to profit by the instruction of the college,

c. students will need strengthening in the history of art and art appreciation

d. students will be specialists in only one area of the visual arts and will, therefore, need to broaden and strengthen their knowledge of all arts media,

The purpose of the departmental programme is to develop a teacher of the visual arts who will be :

1. Liberally educated to fulfil his role as a citizen in a democracy
   He should possess a broad understanding of the role of the arts in the social, economic, technological and cultural life.
2. Competent to represent the education professioning and his subject-matter field in the school and in the community
   He should be able to exert leadership in programme development in art for schools and provide direction for art in the life of the community
3. Thoroughly grounded in both the theory and practice of his subject matter and possessed of the knowledge and skills necessary for teaching theory and practice in an integrated manner

He should possess an advanced understanding and competence in one of the major arts : (a) drawing and painting ; (b) modelling and sculpture ; and (c) graphics ; and possess a basic knowledge of art materials and their application in the other two areas.

4. Able to contrive and use a variety of effective teaching-learning procedures

   He should be competent and willing to experiment with proved and new methods of presenting art experiences to children.

5. Able to develop and use instructional materials including audio-visual materials

6. Able to select and organize subject matter for instructional purposes. He should be capable of assessing the adequacy of the present syllabi in art and willing to revise and improve the offerings in the art programme.

7. Able to use a variety of methods to evaluate pupil progress and his own growth as a teacher

8. Capable of recognizing individual needs of students and creating teaching-learning situations based on individual needs
   He should be skilful in recognizing and fostering creative talent in pupils.

9. Able to select and use appropriate equipment and determine supply needs

   He should be able to plan, equip, and organize an art department and select, write specifications, and order necessary equipment and supplies.

10. Able to function effectively in the guidance programme of the school

11. Capable of organizing and supervising co-curricular activities
    He should be able to organize and supervise art-related activities such as special displays, exhibitions, garden layouts, decorations, and dramatic settings.

12. Capable of functioning effectively as a teacher as evidenced by actual classroom performance

    He should be capable of demonstrating a high level of performance in internship in teaching in a school with a composite approach to art as a school subject.

13. Proud of his profession and interested in continued growth through participation in professional associations, community leadership activities, inservice education, research and experimentation

Teaching Method

One major advantage of the afternoon block-of-time is that of potential flexibility. Although a proposed division of time is given below, the staff of the fine arts department will be expected to modify the schedule to meet the demands of special circumstances. Instruction in methods and content should both be closely identified with the classroom situation in the multi-purpose school. Thus the twenty periods per week may be utilized in the following manner :

		Approximate periods per week
1.	Methods of teaching the visual arts including observation and participation in schools	6
2.	Content study	
	a. History of the visual art (oriental and western)	3
	b. Art appreciation	3
3.	Studio work and independent study	8
	Total	20

Content

Unit 1. Methods of Teaching the Visual Arts

a. Psychology of childhood and adolescence with special reference to creativity and talent : recognition and guidance of creative abilities
b. Characteristics of creative work of children of different age groups
c. Philosophy and role of art in life and education
d. Objectives and purposes of art education for the different age groups
e. Programme development of art education for the various age groups : course planning
f. Special techniques and methods in the visual art
g. Organization of art classes
h. Teacher-pupil planning in art
i. Equipment, supplies and room arrangements
j. Role of the art teacher in guidance
k. Evaluation of art work, knowledge and technique
l. Important research in art education
m. Professional growth and development

n. Student field experiences :
   1. Observation
   2. Planning and teaching short units
   3. Preparing for the internship experience

o. Selecting, preparing and using instructional materials
   1. Various types and uses of instructional materials
   2. Creating instructional materials in the classroom
   3. Cooperating with the inter departmental unit on audio-visual materials on a jointly planned unit of about one week

Unit 2. History of Art (Oriental and Western)

a. ART IN INDIA : Architecture, sculpture and painting
   The following periods : early Buddhist : Maurya, Sunga and early Andhra ; Kusan and later Andhra ; Gupta, mediaeval, Chola, and Pallav

   MUSLIM ARCHITECTURE : Jain, Mughal and Rajput Paintings. Modern Indian Art and its problems

b. Art in Indonesia

c. Art of Egypt, Persia, China, Japan and Tibet

d. The pre-classical, Greek, Roman and Byzantine Art

e. Romanesque and Gothic periods, early Siense, Florentine and Flemish Paintiangs

f. Renaissance, Seventeenth and Nineteenth Century Academic Art ; Romanticism, and later Nineteenth and early Twentieth Century Art

g. Modern movement ; Impressionism, Post-impressionism, Cubism, Abstractionism

Unit 3. Art Appreciation

a. Meaning and origin of art

b. Socio-religious symbolism in art

c. Significance of form and design : expression of the medium, attributes of the medium, difference between representation, illustration and expression

d. Aesthetic attitudes and kinds of beauty : natural and formal beauty ; beauty in nature ; beauty in art forms

e. Aesthetic judgment : the logic of art

f. Art criticism

Unit 4. Studio Work and Independent Study

Practical work will be done in (a) drawing and painting, (b) sculpture and ceramics, and (c) graphics.

Theoretical knowledge of the processes of the media will also be given. During the duration of the course each student will complete ten assignments in each of two of the above fields other than the one of his specialization at the diploma level.

Evaluation

The degree to which a student succeeds should be based on an evaluation of behaviour manifested. Each competency serves as a criterion. No limited evaluation such as the performance on a single written examination should determine the mark assigned. Observation and evaluation in studios and in the schools should constitute a significant portion of the total evaluation of the student and his success in the programme.

SYLLABUS—ONE-YEAR PROGRAMME—BLOCK-OF-TIME
FOR HOME SCIENCE

Nature and Purpose of the Programme

The departmental programme is designed to contribute to the general objectives of the college and to be taught in close relationship to the forenoon programme.

NATURE OF STUDENT PERSONNEL

Only students with at least a B. Sc. (Home Science) will be enrolled in this programme. It is recommended that preference should be given to the following categories in the following order :

1. Those deputed from multipurpose schools in which they have served.
2. Those deputed from multipurpose schools, but without secondary school teaching experience.
3. Those who have completed a B.Sc. (Home Science) or B.A. (Home Science) but are not deputed from any school.

PROFESSIONAL COMPETENCIES

The purpose of the One-year Programme is to produce a home science teacher who will be :

1. Liberally educated to fulfil her role as a citizen in a democracy.

   The teacher of home science will work directly and closely with pupils, their families and communities. To be effective, she must be aware of the problems, resources and aspirations of the people and the dynamic changes taking place that affect family and community living in India today. She must recognise her role as a citizen in a developing democracy and give her support to important legislation affecting women and their families.
2. Competent to represent the education profession and her subject-matter field in the school and in the community.

   Home science teaching, to be effective, must be based on the needs and the cultural background of the home, family and community. While it must be built on sound educational principles, it should

be complete, accurate and up to date in content, utilizing the latest developments and research findings, in the different areas of home science, namely : foods and nutrition, child develpment ; home management ; family relationship, health, and textiles and clothing.

3. Thoroughly grounded in both theory and practice of her subject matter and possessed of the knowledge and skills necessary for teaching theory and practice in an integrated manner.

   Home science teaching will be meaningful only when theory is correlated with practice in the laboratory and home. Home science teachers should therefore be well equipped in the principles of home science and in home-making skills applicable to the wide range of income and living standards found throughout India.

4. Able to develop and use a variety of effective teaching-learning procedures.

   The wide variety of problems encountered in home daily offer unique opportunities for the home science teacher to make her teaching effective.

5. Able to develop and use instructional materials including audio-visual materials.

   The many practical applications of science to daily living challenge the alert home science teacher and offer her many opportunities to make her teaching lively, interesting and meaningful through the skilful preparation and use of teaching aids. This involves continually re-appraising and creating instructional materials.

6. Able to select and organize subject matter for instructional purposes. The home science teacher should plan and design learning experiences applicable to handling home situations and meeting and solving daily problems. The syllabus must be reviewed and improved annually to include new and important subject matter of home science.

7. Able to use a variety of methods to evaluate pupil progress and her own growth as a teacher.

   The home science teacher should evaluate the progress of pupils in order to develop and adjust instructional programmes to suit their needs. This may be done through written assignments, examinations, projects in the class and home, problem solving experiences and careful observations of improvement in pupil behaviour and progress in terms of their health, participation in activities, personal and family relationships and all-round development.

8. Capable of recognising individual needs of students and creating teaching-learning situations based on individual needs.

   In dealing with adolescent girls who are going through rapid changes and development, the home science teacher needs to understand and be skilled in meeting their physiological, emotional and spiritual needs at this crucial period.

9. Able to select and use appropriate equipment and determine supply needs.

   Home science teachers require a variety of equipment and supplies which need careful selection so that the laboratory conditions are reasonably similar to conditions in Indian homes. She should also develop the ability to improvise equipment from materials already at hand.

10. Able to function effectively in the guidance programme of the school.

    Secondary education is terminal for many girls, thus the home science teacher needs to guide them into careers suitable to their capacities. To do this effectively, she must understand the requirements for such positions as gramsevikas, mukhyasevikas, nurses, as well as teachers. She must be in a position to encourage girls to follow up their learnings contructively as they prepare for the important career of home-making.

11. Capable of organizing and supervising co-curricular activities.

    Organizing home science clubs in the school and outside, *Mahila Mandals* and Young Homemaker groups in the community are some of the important co-curricular activities the home science teacher is expected to carry out. Getting parents interested in sending their children to school is another important activity.

12. Capable of functioning effectively as a teacher as evidenced by actual classroom performance.

    The home science teacher should constantly enrich her teaching capacity and interest the community in home science education for girls.

13. Proud of her profession and interested in continued growth through participation in professional associations, community leadership activities, inservice education, research and experimentation.

    A good home science teacher must be an active member of the local and national home science associations and other associations working for the improvement of home and family living. She should read professional journals and, if possible, subscribe and contribute to

them. She should visit research laboratories to acquire the latest information and keep abreast of the current developments in her field.

Teaching Method

The block-of-time, consisting of 20 hours, allotted to home science education will be organized under three headings, namely:

a. Methods of teaching home science—about 8 periods per week
b. Individual effort and home science seminar—about 5 periods per week
c. Proficiency in home science subject-matter—about 7 periods per week

METHODS OF TEACHING HOME SCIENCE

This part of the programme will be based on the general method units provided in *Workshop in Teaching*. The entire responsibility of observations of students and classes and of practice in teaching skills, such as teacher-pupil planning, curriculum planning, preparation of materials, laboratory management and teaching during the internship period rests with this aspect of the programme.

A great variety of techniques of instruction will be employed. The personnel of the department will be responsible for organising and conducting the experiences and utilising resources from other departments.

INDIVIDUAL EFFORT AND HOME SCIENCE SEMINAR

The purpose of this part of the programme is to develop special skills in students and to strengthen areas lacking in their background. Guidance for individual work will be given by staff counsellors who will be assigned a small group of students. Staff members will be expected to challenge gifted students and to help weaker students. Projects will be presented in the seminar.

The seminar is planned to acquaint the student with changing living conditions and new developments in home science and home science education and to strengthen her understandings and skills in certain areas. Such study will include the review of relevant research and the designing of research projects of an elementary nature.

Through the assignment of a minimum of four projects and papers, opportunity will be given to each student to do independent work and investigation and to present the materials for criticism. Panel discussions and reports by guest home science experts will provide enrichment for the seminar.

PROFICIENCY IN HOME SCIENCE SUBJECT MATTER

This aspect of the programme will deal with developing abilities in the teacher trainee to conduct interesting meaningful practicals in the home science laboratories of the multipurpose high schools. This will involve skilled handling of both subject matter and practicals some of which may be based on pupil's suggestions.

The time will be distributed among the various subjects felt to be most needed by the students in preparing them to teach the multipurpose school syllabus.

Content

METHODS OF TEACHING HOME SCIENCE

Unit 1. History of home science education in India and the Home Science Association of India

History of home science in other countries—U.S.A., England, New Zealand, Europe, Japan, Phillippines, Indonesia, Malaya and others

Unit 2. The history, philosophy, meaning, and scope of home science ; the place of home science in secondary education and multipurpose schools ; its relationship to other subjects in the high school ; objectives of home science education with particular reference to fulfilling the needs of pupils

Unit 3. The home science teacher : essential qualities and responsibilities

Unit 4. Study of home science curriculum prescribed for the multipurpose school : organizing the home science curriculum into teaching units ; integration of theory and practice ; planning sequences for the year

Unit 5. The home science department : location, space, equipment and resources such as water and electricity ; planning single multipurpose or multiple rooms for organizing the facilities available for teaching ; methods of adapting and improving facilities ; equipment-functional, locally available, economical ; improvising equipment ; home science library—books, magazines, periodicals, bulletins and recent literature ; other audio-visual aids—films, filmstrips, bulletin board, exhibits, flash cards, posters, pictures, models, charts, specimens, samples, etc.

Unit 6. Staff for teaching and assistance : qualifications and number required ; management of the home science department ; budgeting ; making an inventory and ordering items and keeping records

Unit 7. Characteristics of adolescents ; how adolescents learn and develop ; implications for teaching home science, teacher-pupil planning ; guidance to be offered by the home science teacher

Unit 8. Methods of teaching as applied to home science : observations ; discussions ; panel discussion ; demonstration ; laboratory ; home and school projects ; use of home experience ; field trips ; exhibitions ; role playing ; utilization of festivals ; seminars ; symposia ; choice, application and evaluation of these methods including effectiveness of combinations

Unit 9. Evaluation

a. Evaluating pupil achievement through conferences, change in attitudes and behaviour, change in habits and practices (physically, mentally, emotionally and spiritually) and using written tests, assignments, practical work and examinations

b. Effectiveness of teaching through : personal satisfaction ; appreciation of administration and community ; pupil performance in examinations ; pupil responses ; and changes noticed in pupils

Unit 10. The school and the community : contributions of the home science department to the school and community ; the value of home science club activities to the total home science programme, to the school and the community ; how to plan and organize home science clubs to further interest in home science and to develop leadership qualities ; programmes for different groups in the community ; work with adults ; parent-teacher associations and the home science teacher

Unit 11. Role of home science in community development and extension services : functions of gramsevikas and mukhyasevikas

Unit 12. Continuous professional improvement : need for methods

Unit 13. Observations of model lessons

Unit 14. Participation in approved schools

Unit 15. Evaluation of lessons taught

Unit 16. Selecting, preparing and using instructional materials : criteria for selecting, preparing and using instructional materials ; preparing materials ; cooperating with the inter-departmental unit on audio-visual materials

PROFICIENCY IN HOME SCIENCE SUBJECT MATTER

Unit 1. Foods and nutrition

a. Classifying foods according to constituents ; study of food values

b. Study of different foods available locally at different seasons and how to make best use of them
c. Study of existing food habits of families
d. Working out suitable balanced diets within allotted amount
e. Cooking with different fuels and experimenting on cooking methods—cooking with different stoves and ovens and using different methods
f. Working out the family food budget and preparing records of food experiences of family per month
g. Planning and arranging the kitchen : work tables, sigries, shelves, etc., light, ventilation, and cleanliness
h. Experiments with methods of preparing important foods
i. Preparing diets for different diseases
j. Observation of the causes of deterioration in foods ; preservation of foods, preparing pickles (according to seasons), preparing jams and jellies ; storage of preserved foods

Unit 2. Household Management and Housing

a. Visit to houses under construction to see how houses are being constructed ; project of making a model house ; use of different types of cleaning equipment and brooms ; projects on cleanliness of home and surroundings ; experiments with colour combination for various applications in the home
b. Experiences with indigenous floor decoration, such as *rangoli kolom alpane*
c. Flower arrangements ; making vases from indigenous articles
d. Furnishing the room within available means
e. Cleaning of glassware, mirrors, cupboards ; preparation and use of polishes ; cleaning of metals, kitchen utensils, cutlery, crockery and other metal articles like vases and trays ; arrangement of utensils and books in the home ; simple experiments with cleaning substances ; methods of using insecticides, such as, D.D.T., phenyle, lysol, Dettol, borax, etc. ; preparation of simple household polishes, such as, metal and furniture polishes
f. Division of labour in the home : making of plans to show wise division of labour for a day and for a week ; allowing time for rest, etc.
g. Planning budgets at different levels of the income for wise use of money
h. Visits to markets and cooperatives and learning how to select and buy goods

i. Keeping personal accounts, opening and maintaining bank accounts
j. Visit to post offices, filling out a money order form
k. Developing suitable hobbies for supplementing family income
l. Home management, residential stay for seven days
m. Use of labour saving devices such as fruit juice extractors, parrs, grinders, mixers, potato mashers, studding scrapers

Unit 3. Child Development and Mother Craft

a. Visiting prenatal clinics and health centres ; bringing a doctor to talk to the pupils regarding pregnancy and lactation ; preparation for the arrival of the baby ; making formulas for artificial feeding ; bathing the baby ; caring for the other needs of the baby
b. Observation of children's play habits and recreation ; visit to nursery schools and Balwadis ; making of simple toys for children ; writing games for children, collection of songs for children ; selection of children's clothing

Unit 4. Textiles and Clothing

a. Demonstrate with the physical properties of fibres by burning tests on cotton, silk, wool, rayon ; test the chemical properties by the use of simple reagents such as acids and alkalies
b. Demonstrate on the operation of a simple loom : making a simple weave ; study the different varieties of khadi, handloom and mill goods ; select suitable colours, designs and combinations for ordinary and occasional wear ; plan the clothing ; compare the ready-made clothing items available with the prices ; testing of hardness in water with soap ; demonstration on different methods of washing clothing ; removal of common stains from fabrics ; preparation of soap by cold process
c. Demonstrate the use and care of a sewing machine
d. Guide students to take their body measurements
e. Draft and construct the following garments by simple methods—child's knickers, child's frock, sari-petticoat, choli, bodice, apron
f. Mending torn clothes, remodelling usable items of clothing

Unit 5. Home Nursing, Health and Hygiene

a. Demonstration of correct postures
b. Comparative study of two white rats of which one is provided with sufficient nutritive food and the other with insufficient food and careful observation of these with regard to their weights and growth patterns

c. Demonstration of first aid to persons catching fire in the kitchen
d. First aid to the injured in the school
e. Practising different types of bandages
f. Preparation of the household medicine chest
g. Preparation of the first aid box for use in the home
h. Visit to the local water works to see how water is purified for drinking purposes
i. Preparation of common insect repellants such as pyrethrum water, kerosene oil emulsion, etc., and their use
j. Demonstration of various methods of disinfecting rooms
k. Bed-making for patients—change of sheets and pillow-cases
l. Preparing temperature charts—methods of using the thermometer
m. Preparation of diets for the sick children and adults (to be correlated with foods and nutrition) from :
    1. barley water
    2. whey water
    3. *kanji*

N.B. Some practicals in physiology and anatomy can be correlated with the common course in general science

Unit 6. Human Relationships

a. Discussions, role playing and dramas on how to maintain good relationships with others ; organizing pen friends clubs, community clubs, girls clubs, visit to neighbour's house to practice being good guests ; taking part in dramas, debates and other social functions
b. Visiting hospitals, slums, beggar homes, to be of service to the needy ; working with welfare agencies
c. Celebrating different festivals in the school
d. Taking part in cooperative relief work, conducting exhibitions and excursions
e. Becoming member in A. C. C, N. C. C. and Girl Guides
f. Contributing volunteer service during fairs and festivals in schools
g. Organizing self-government in schools
h. Conducting prayers and assemblies in the school, taking part in the social activities
i. Participation in women's clubs such as charitable institutions, welfare associations, and mother and child welfare clubs

Evaluation

One paper on *Methods of Teaching Home Science* will be offered. The examination will be based on the units and there will be 100 marks of which 25 will be internal and 75 will be external.

Content will be given 100 marks all of which will be based on internal assessment.

Internship in teaching will be given 300 marks—all internal. The methods of evaluation of the internship are outlined in Part II (*Internship in Teaching*).

SYLLABUS—ONE-YEAR PROGRAMME—BLOCK-OF-TIME FOR TECHNOLOGY

Nature and Purpose of the Programme

The departmental programme builds on the common learnings of the morning programme, making applications and expansions of the basic principles and theories in the teaching of technical subjects. In addition, there is individualised and group technical work to broaden and supplement the preparation of the student in technology.

It is assumed that students *seeking degrees* will have one of the following qualifications :

1. a recognized engineering degree or its equivalent in any branch of engineering, or
2. a recognized degree in arts or science and a diploma in any branch of engineering.

Students *seeking diplomas* will be admitted to the programme if they have (1) successfuly completed secondary school, and (2) received either an I.T.I. Certificate (plus two or more years experience) or a Polytechnic Diploma or the equivalent of either.

The purpose of the One-year Programme is to help each student attain a high level of proficiency as a teacher. In other words it is essential that he be :

1. Liberally educated to fulfil his role as a citizen in a democracy.
   The student should be skilled and knowledgeable in technical education but he should also be able to intelligently participate in school and community affairs.
2. Competent to represent the education profession and his subject-matter field in the school and in the community.
   The student should know the historical antecedents for his work, the trends and developments in technical education and the contribution of his field to his school, community, state and nation.
3. Thoroughly grounded in both the theory and practice of his subject matter and possessed of the knowledge and skills necessary for teaching theory and practice in an integrated manner.

4. Able to contrive and use a variety of effective teaching-learning procedures.
5. Able to develop and use instructional materials including audio-visual materials.
6. Able to select and organize subject matter for instructional purposes.

   The student should develop competency in (a) analyzing a job or trade and planning an instructional programme for teaching it ; (b) identifying the requirements of a pre-professional engineering programme ; and (c) making specialized contributions to the general education aspects of the secondary school programme.
7. Able to use a variety of methods to evaluate pupil progress and his own growth as a teacher.
8. Capable of recognizing individual needs of students and creating teaching-learning situations based on individual needs.
9. Able to select and use appropriate equipment and determine supply needs.

   The student should be familiar with correct procedures and requiremems in obtaining the physical requirements for and effective instructional programme in technical education : equipment, supplies, and materials.
10. Able to function effectively in the guidance programme of the school.

    The student should be informed on employment requirements and opportunities in technical fields. He should know the current procedures for gaining employment and should know the sources of information that can help him keep abreast of job trends in technical fields.
11. Capable of organising and supervising co-curricular activities.

    The student should be experienced in planning co-curricular activities and should know the contributions he can make to the total co-curricular programme of the school.
12. Capable of functioning effectively as a teacher as evidenced by actual classroom performance
13. Proud of his profession and interested in continued growth through participation in professional associations, community leadership activities, inservice education, research and experimentation.

Teaching Method

There will be four periods in the afternoon block for five days of the week. Thus there will be twenty scheduled periods per week which may be utilized in the following manner.

Category	*Approximate period per week*
1. Methods of teaching technology including observation and participation in schools	5
2. Content	
a. Introduction to engineering	5
b. Workshop practice including instructional tours to industrial establishments	10
Total	20

The methods course will be required of all. It will include lecture, discussion, planned and purposeful observation, and supervised student teaching. Throughout the course, selected observations, role playing, and supervised experiences will be used to demonstrate and reinforce the learning of principles and techniques. Observations will be made in the demonstration school and in neighbouring schools, industries, and communities. Students should plan and carry out simple instructional activities in group and individual guidance, tutoring, and teaching short units. Instructional materials, course outlines, and curricula will be prepared, evaluated, and improved.

It is assumed that students will have adequate specialized preparation in their respective fields of engineering, however, for secondary school teaching purposes their manipulative skills and breadth of background in engineering may be lacking. Their individual subject-matter needs will be determined upon their admission and their programme of studies and activities will be planned accordingly.

The technology staff will prepare an inventory, with which to assess the academic and professional backgrounds of all technology students. The staff will then collect and analyse the data for each student and will schedule the student's afternoon programme accordingly to his needs.

Most of the students will come oriented to an instructional programme in which the teaching of theory and practice is separated. Throughout their preparation in this programme instruction in theory and practice will be integrated so that the students will in turn go into the secondary schools experienced in, and able to provide, this kind of instruction.

Content

Content elements as listed are meant to indicate the scope of total content. It is assumed that much of this content will have been previously mastered. Through the inventory, student abilities will be ascertained and individualized programmes will be planned.

METHODS AND TEACHING PRACTICE

Unit 1. How educational philosophy gives direction to teaching methodology—how several common philosophies affect teaching practices in common classroom and laboratory situations

Unit 2. How educational psychology gives direction to teaching methodology.

a. individual differences versus uniform standards
b. learning theories versus unfounded practice

Unit 3. Planning and Preparing Lessons

a. selecting the objectives and content of the lesson
b. the relationship of the lesson to the complete course or unit
c. keeping connections between lessons
d. preparing the lesson plan
e. selecting and preparing written instructional materials
f. selecting and preparing other teaching aids

The audio-visual area will be covered in the inter-departmental units.

Unit 4. Methods of Teaching Hand Skills

a. demonstration
b. trial and error
c. review of progress and remedial help
d. refinement and application

Unit 5. Methods of Teaching Technical Knowledge

a. the illustrated lecture
b. integration of theory and practice
c. directed self-study
d. discussion
e. experimentation and problem-solving

Unit 6. An Adequate Learning Environment

a. planning techonlogy facilities and obtaining supplies and equipment
b. causes and correction of discipline problems
c. class organization and management

Unit 7. Making and Improving Courses of Study and Curricula

a. techniques for analyzing and organizing technical content
b. creation or selection of the appropriate teaching-learning procedures
c. reviewing and improving courses and programmes in technology
d. teacher-pupil planning

Unit 8. Exercises in the Evaluation and Improvement of Technical Instruction
- a. dual purpose of evaluation—evaluate both pupil progress and quality of instruction
- b. selection or development of evaluation materials
- c. use of self-evaluation techniques

Unit 9. Utilizing Resources, Observations, Clubs and Field Trips
- a. purposes and evaluation
- b. planning and executing teaching units based on these techniques
- c. community relationships

Unit 10. Review and Study of Educational Research dealing with Methodology
- a. review research and study techniques
- b. make applications of research in technical instruction
- c. conduct a pilot study of some teaching-learning procedure

Unit 11. Preparing for Student Field Experiences
- a. observations
- b. sample lessons and demonstrations
- c. review of cooperating school programmes
- d. developing a list of desired outcome from practice teaching

Unit 12. Guidance
- a. contributions of the technology teacher to the school guidance programme
- b. guidance information in technical fields
  1. employment procedures and requirements
  2. employment opportunities
  3. employment trends

SUBJECT MATTER

Unit 1. The Engineer and His Work
- a. the preparation of engineers
- b. the work of the engineer
- c. the relationship of the engineer to the tradesman, technician, and scientist

Unit 2. Civil Engineering :
- a. basic principles and practices of surveying, building construction hydraulics, and sanitary engineering
- b. construction of transportation systems

Unit 3. Electrical Engineering
- a. basic principles and practices of power generation, transmission, distribution, and utilization
- b. electrical and electronic communications systems
- c. data processing

Unit 4. Mechanical engineering
- a. basic principles and practices
- b. combustion engineering
- c. mechanical design
- d. automotive, marine and aeronautical engineering

WORKSHOP TECHNOLOGY AND PRACTICE

Unit 5. Power, Safety and Care
Unit 6. Forging, Rivetting, Soldering, Brazing
Unit 7. General Woodworking
Unit 8. Bench Work
Unit 9. Advanced Bench Work
Unit 10. Measurement and Precision Work
Unit 11. Foundry
Unit 12. Welding
Unit 13. Turning
Unit 14. Shaping Machines
Unit 15. Milling Machines
Unit 16. Drilling Machines
Unit 17. Grinding
Unit 18. General Electricity and Electronics
Unit 19. Industrial Design and Industrial Production

Evaluation

Effective evaluation of the programme should be based upon comprehensive evaluation of the students in terms of the competencies the programme is designed to develop. Rating scales, performance tests, and other evaluative techniques should be employed. Methods, content and teaching performance are to be treated separately in the final assessments.

COOPERATIVE PROGRAMME IN STUDENT FIELD EXPERIENCE

SYLLABUS—ONE-YEAR PROGRAMME—INTERNSHIP IN TEACHING

11 Periods/No Paper/300 Marks

Nature and Role of the Course

This course is designed to provide each student with a comprehensive experience for the development of teaching competence. The activities will take place in a realistic teaching-learning situation within the several cooperating schools. To make the total experience similar to actual teaching, students will work full time in the cooperating schools. A block of about eight weeks time will provide the student ample opportunity to become well-acquainted with the school and the community setting and to function in the normal role of a teacher.

Students will be assigned to cooperating schools in groups A and B. Group A will begin its internship at about mid-point of the college year, continuing for about eight weeks. Group B will go to designated schools immediately after group A completes its experience and also receives eight weeks experience. All the students in a department will undergo internship during the same period.

Approval for entering into the internship experience will be decided within the respective departments. Records of achievement as well as other sources of data will be utilized to determine the student's fitness for the internship.

Teaching Method

Actual participation on the part of each student will be the basis of this course. The selection of specific experiences to be provided and when they are to occur will be the combined responsibility of the cooperating teacher, college personnel and the student teacher.

The majority of assistance to the student-teacher during internship will come from the cooperating teacher. Experiences are to be planned, executed and evaluated cooperatively by the student-teacher and the cooperating teacher. Personnel from the several departments of the Regional College

will visit the cooperating schools for the purpose of observing student teacher performance. Critiques of all these observations should include the college personnel, the student teacher, the cooperating teacher and the headmaster.

The early part of the internship should be devoted to practising the many separate tests of a teacher, both instructional and non-instructional. A full teaching assignment should be gradually assumed by the student during the final two or three weeks of the course.

Periodic seminars will be held on a weekly or bi-weekly basis when students from several cooperating schools will meet with personnel from the Regional College. Discussions of teaching problems and experiences will be the focal point for these sessions and several written assignments will be included in the requirements.

Content

A suggested outline of student experiences applicable to all teaching areas during internship follows.

Unit 1. Overall Departmental Programme Planning

a. prepare a plan for starting a new department in a school including instructional programme, physical facilities and staffing patterns

b. review the total instructional programme and the long-term plan with the cooperating teacher

c. conduct an evaluation of the departmental programme in the light of recognized criteria, and develop a plan for continued programme development

Unit 2. Planning and Teaching Units of Instruction :

a. become acquainted with students in the department

b. discuss the teaching programme of the department with the cooperating teacher

c. observe the cooperating teacher during teaching and discuss cooperatively the methods used and results obtained

d. plan and teach a variety of types of lessons using discussion, demonstration, lecture and other methods. Cooperatively evaluate results with the cooperating teacher and personnel from the Regional College

Unit 3. Guidance and Counselling

a. discuss the overall guidance programme of the school with the cooperating teacher

b. conduct periodic conferences with an assigned group of students

c. develop a record for several students
d. develop a comprehensive case study of one student based upon periodic observations and conferences
c. confer with several graduates of the department

Unit 4. Physical Facilities
a. examine and evaluate the overall physical facilities of the total school
b. examine and evaluate physical facilities in the department

Unit 5. General School and Community
a. examine and evaluate the total instructional programme of the school in light of the community needs
b. examine and evaluate the relationship of the school to the community
c. examine and evaluate the relationship of the department to the community
d. observe teachers other than the cooperating teacher
e. confer with individuals in the community regarding plan of graduates
f. participate in co-curricular activities in the school
g. teach several classes in the school outside the department in which major experience is provided
h. attend staff meetings

Unit 6. Professional improvement
a. attend meetings of professional education organizations and evaluate their programmes and impact on education
b. read and evaluate professional publications
c. attend inservice education meetings and activities

Evaluation

Evaluation of the course will be internal and will be based on a co-operative, continuous process, involving the student teacher, cooperating teacher and other personnel of the cooperating school, and personnel from the Regional College. The major part of the measurement of achievement should be based upon performance criteria.

PROGRAMME OF EXTENSION SERVICES

One of the important functions of the Regional Colleges of Education is to provide facilities for and organize inservice training for teachers in secondary schools. Furthermore, each faculty member of a teacher training institution must have continuing contacts with inservice teachers and with schools if the instructional programme is to be vital. Therefore, the Regional Colleges of Education must provide an effective programme of inservice education, extension and field services not only to meet the needs of the schools but also to keep their own instructional programmes in tune with the needs of teachers and schools.

Three of the objectives of the Regional Colleges refer to extension services and indicate the place of significance given to the programme in the total plan of the colleges. These are :

1. to provide inservice courses for the existing teachers of the practical subjects in multipurpose schools,
2. to provide inservice programmes and field services for the teachers, supervisors and administrators concerned with the multipurpose school, and
3. to function as regional centres for programmes of inservice education and field services for secondary schools in general.

Although the initial inservice courses may be restricted to the practical subjects in the multipurpose school, the Regional Colleges should gradually build towards providing inservice education in all areas of secondary education.

The inservice and field services programmes of the colleges will be of two major categories :

1. *Short-term Courses*, workshops and seminars provided on the college campus by the departments of the colleges for inservice teachers, administrators and service personnel in the multipurpose and higher secondary schools.

2. *Extension and field services* provided through the extension centre on the Regional College campus.

INSERVICE COURSES ON THE CAMPUS. During the academic year and vacations, each college will organize and schedule a series of courses, work-

shops and seminars for inservice teachers, supervisors, administrators and others who will be brought to the campus for study. These short-term courses will be based upon the needs of the region as determined in cooperation with state department officials, headmasters and others. The duration of each course will depend upon the needs of the course and the time for which the participants can be spared from their schools or departments. It is anticipated that these courses may be from one week to as long as three months in duration.

In determining the departmental staff, time equivalent to the teaching load of one staff member was added to each department for inservice and extension work. Thus, at all times, there will be staff available in each department to man short-term courses. No one staff members should participate. Resource persons will be drawn from outside, whenever, necessary.

In the projected enrollment for each college, fifty seats have been reserved on each campus for participants in short-term inservice courses. The courses should be so coordinated and planned that there will be a steady flow of inservice teachers and other school personnel to and from the college campuses.

The following short-term inservice courses may be provided :

a. Specialized courses for teachers in specific subjects and areas
These courses may (1) build subject matter competency, (2) present new methods of teaching to increase the teacher's classroom efficiency, (3) discuss broad problems of education to strengthen the teacher's educational philosophy.

b. Courses for headmasters

The colleges can perform a very useful function in providing an opportunity for headmasters to meet and discuss mutual problems, to study new methods of school administration, and to become better informed on various aspects of the school programme.

c. Courses for school service personnel

The college services should be extended to all school personnel including librarians, audio-visual technicians, laboratory and workshop assistants, playground and physical education personnel.

d. Courses for school guidance personnel

The multipurpose school is greatly conditioned by the quality of its guidance programme. The constant upgrading of guidance personnel is essential and will be an important component of the inservice programme of the colleges.

e. Courses for teachers and headmasters in cooperating schools

The proposed plan for internship in teaching places responsibility upon the cooperating teachers and headmasters. These people must be brought to the college periodically.

f. Courses for school inspectors, service consultants and other officials of the state department of education

g. Summer Institutes.

EXTENSION AND FIELD SERVICES. An extension centre will be established on each Regional College campus in due course. These college centres are to supplement and not replace the extension services at present rendered by the extension centres and units in the training colleges in the place where the college is located.

TEACHER EDUCATION PROGRAMMES IN INDUSTRIAL CRAFTS

THE NEED FOR THE EDUCATION OF INDUSTRIAL CRAFTS TEACHERS IN INDIA

Since independence craft education has been given a place of significance at all stages of the school system. In the basic schools crafts constitute a vital core of the programme around which large parts of knowledge and skills are built. In non-basic schools, also, craft forms a compulsory subject in most schools. In the curriculum of the higher secondary school, it constitutes one of the core subjects. If inspite of the importance accorded to craft in the curriculum, craft education in schools is unsatisfactory, it is mainly because there are no trained and qualified instructors to handle the subject in an effective and purposeful manner.

There is now a growing urgency to develop a high degree of craft skills of a technical nature in the youth of the country. Crafts subjects should become more industrial and technical in anticipation of certain aspects of the Indian culture of the near future. Particularly, at the higher secondary school level, students should be introduced to crafts that involve extensive use of specialised hand tools and machines. Hand work of the type represented by most existing village handicrafts will remain an important part of primary and middle school activities. However, more industrial and machine oriented crafts should find a place in the secondary school programme.

The existing facilities for preparing craft teachers are very limited and most are quite inadequate. Moreover, the teaching of crafts requires not only the usual professional knowledge about the theory and techniques of teaching but also special technical knowledge and skills involved in the crafts selected for teaching. Mere technical training in itself is not enough unless an integrated programme of craft teacher education is developed.

Well coordinated programmes of preparation of industrial crafts teachers will not only help in meeting the teacher shortage in craft instruction but will also go a long way in developing industrial crafts instruction in our schools in a systematic manner. The programmes outlined in this section are steps in this direction.

OBJECTIVES OF INDUSTRIAL CRAFTS IN THE SECONDARY SCHOOL

A statement of objectives of industrial crafts at the secondary stage is given below. The courses of craft teacher education have been planned with these educational objectives in view. They are:

1. develop hand and tool skills for productive work.
2. develop a positive attitude toward work and skilled workers.
3. contribute to an awareness of possible occupational choices.
4. develop an appreciation of good craftsmanship and design.
5. develop aesthetic taste and appreciation through using suitable media for creative self-expression.
6. provide experiences in problem-solving and experimentation, individually and in groups.
7. contribute to better home living.
8. develop worthwhile leisure time activities.
9. promote good work habits and safe work procedures.
10. develop a basis for intelligent consumption of commercial products.

TYPES OF PROGRAMMES

The following three types of programmes for industrial crafts teachers will be provided by the Regional Colleges:

Type I. Three-year Diploma Programme

This type is designed for matriculates and other non-degree holders who have no training and little or no experience in crafts. Several aspects of this programme are in common with the four-year degree programmes of the colleges.

Type II. Two-year B.Ed. Degree Programme

This programme is designed for first degree holders who have had no training and little or no experience in crafts. The second year of study will follow the same pattern as the one-year B.Ed. degree programmes of the colleges.

Type III. One-year Certificate Programme

This type of programme is designed to serve the needs of craft teachers or persons with crafts training who desire additional training in crafts and in the teaching of crafts.

Although the major intent of these programmes is to develop a supply of teachers for the secondary (including middle) school level, it should be kept in mind that the best qualified students coming out of these programmes may well be assigned as crafts instructors in basic training colleges at all levels to provide leadership in craft instruction.

ADMINISTRATION AND COLLEGE RELATIONSHIPS

All programmes for the education of industrial crafts teachers, including inservice education, will be planned, organized and implemented by the technology department in each Regional College in consultation with the principal and other concerned staff members. The head of the technology department will be responsible for the overall operation and success of the programme. Staff members in technology (industrial crafts) and agriculture will contribute to the instruction.

This administrative pattern will be in effect during the intial years of college operation. As the programme broadens, a department of crafts may be established.

The craft education programmes will be separate programmes of the college ; however, certain relationships will exist with other programmes. Services of the college guidance staff will be available for crafts students to help in their educational, vocational and personal problems. Students in the craft programme will participate in the physical development and health, physical education and recreation activities of the college. Laboratoires and shop facilities of the college will be used for the programme. Several subjects taken up by students in the Three-year Diploma Programme will be the same as those offered by students in the Four-year Degree Programmes. During the second year, students in the Two-year Degree Programme will join with the regular One-year college students for professional courses. Internship in teaching for all three types will follow a pattern similar to that outlined for the Four and One-year Degree Programmes.

SELECTION OF STUDENTS

Students admitted to programmes of Type I and III will be those who have successfully completed the high or higher secondary examination preferably with science and/or craft training and aptitude. Candidates for the One-year Certificate Programme should also possess teaching experience and/or a background of one or more crafts. Candidates for the Two-year Degree Programme in industrial crafts must hold a bachelor's degree from a recognized institution.

COMPONENTS OF THE THREE-YEAR DIPLOMA PROGRAMME

The outline of the programme in Table 11 indicates the subjects to be studied and the number of periods per week for each subject for each of the three years.

TABLE 11

THREE-YEAR DIPLOMA INDUSTRIAL CRAFTS TEACHER EDUCATION PROGRAMME

Subject	*Year I*	*Year II*	*Year III*
	Periods per week		
English	6*	3*	3*
Regional Language	2*	2*	0
Applied Mathematics and Science	4	4	0
Design and Creative Art Activities	3	3	0
Engineering Drawing	3*	4*	0
Woodworking	10	8	8
			or
Metalworking	10	8	8
Electricity	3	3	8
Minor Craft I*	0	0	6
Minor Craft II**	0	0	6
Principles of Craft Education	0	3	0
General and Educational Psychology	0	3*	3*
Methods of Teaching Industrial Crafts	0	0	5
Internship in Teaching	0	0	(8 week block)
H P E & R (mornings and afternoons)	10*	10*	10*
Independent Study	4	4	6
Total Periods/Week	55	55	55

Students in this programme will take up the subjects of English, Regional Language, Engineering Drawing, General Psychology and Educational Psychology along with students of the Four-year Degree Programmes of the colleges. The requirments of morning physical development and the afternoon health, physical education and recreation are also common with students in the Four-year Degree Programmes. Internship in Teaching will follow the same pattern as the Four and One-year Degree programmes.

The subjects of Applied Mathematics and Science and Design and Creative Art activities serve the twofold purpose of general education and ancillary content study. Drawing and shopwork subjects provide both depth and breadth in the industrial crafts. Greatest depth of skills and technical knowledge will be provided in woodworking, metalworking and electricity. Study of two minor crafts in the last year broadens the competencies of the

*Common subjects with Four-year Degree Programmes at college

**To be elected from Ceramics, Leatherwork, Printing or Gardening and such other crafts as may be provided in the college including advanced engineering drawing.

student so that he may be more versatile as a future industrial crafts teacher.

Four professional subjects serve to round out the programme. These subjects provide the philosophical and sociological foundations of crafts in Indian schools, the psychological foundations of teaching and learning, the specific methods of teaching industrial crafts subjects and a concentrated internship in teaching.

The programme provides a balance between general education, subject matter content (shop skills and related technical knowledge) and professional education. Time is allotted in all three years so that students may increasingly develop self-directed study habits through independent study.

COMPONENTS OF THE TWO-YEAR B.ED. DEGREE PROGRAMME.

Table 12 outlines the subjects and periods per week for the two years of the degree programme in industrial crafts. This programme is designed to produce a skilled industrial crafts teacher yet professionally qualified and the holder of a B.Ed. degree in crafts. Qualified industrial crafts teachers with *degrees* will help establish craft as a full-fledged subject in the school curriculum.

The entire first year of the programme is devoted to industrial crafts subjects. In addition to introductory subjects of woodworking and metalworking, study of engineering drawing, electrical craft and two minor crafts broadens the skill background of the students. Only one introductory professional subject will be taken up that year, principles of craft education.

The second year of the programme follows the pattern of the regular One-year Degree Programmes of the Regional Colleges. Three professional subjects and independent study periods constitue the morning schedule. In the afternoons, the subjects of engineering drawing, advanced woodworking and metalworking provide depth of skill and related technical knowledge. Methods of teaching industrial crafts and internship in teaching are specialised professional subjects that form the capstone for the programme.

Although this programme does not provide the same total number of periods for depth in industrial crafts subjects when compared to the Three-year Diploma Programme, several compensating factors exist. Firstly, it provides full professional training leading to a B.Ed. degree in crafts. Secondly, the students will be more mature, more vocationally goal oriented and more capable of handling English as the medium of instruction. In addition the programme produces a product fully qualified to pursue post-graduate professional studies leading to positions of influence and leadership in crafts education.

TABLE 12

TWO-YEAR DEGREE INDUSTRIAL CRAFTS TEACHER EDUCATION PROGRAMME

Subject	*Year I*	*Year II*
	Periods per week	
Engineering Drawing	3*	4*
Woodworking	10*	8*
Metalworking	10*	8*
Electricity	6*	0
Minor Craft***	6*	0
Minor Craft II***	6*	0
Principles of Craft Education	3*	0
Psychological Foundations	0	5**
Social and Philosophical Foundations	0	6**
Workshop in Teaching	0	5**
Methods of Teaching Industrial Crafts	0	5*
Internship in Teaching	0	(8 week block)
Health and Physical Development (Mornings only)	3**	3**
Independent Study	1	4
Total Periods/Week	48	48

COMPONENTS OF THE ONE-YEAR CERTIFICATE PROGRAMME

The plan for this programme is given in Table 13. This scheme is designed to improve upon, extend and expand the craft skills and professional competences of teachers already teaching crafts in schools. Therefore, this programme may be considered a one-year in-service education programme. Students with craft training but with no teaching experience may be admitted if seats are available.

Since candidates for this programme have some teaching experience and/or a background in one or more crafts, certain flexibility must be provided in the programme as outlined. Assessment of the degree of skill in a craft subject will be important for planning schedules for individual students. More time may be devoted to areas of weakness in certain craft subjects.

The period for internship has been reduced to six weeks in this programme. Although the student may have previously taught crafts, this experience is considered to be of great importance.

*Common subjects with Three-year Diploma Programmes

**Common subjects with One-year Degree Programmes of the colleges

***To be elected from Ceramics, Leatherwork, Printing or Gardening and such other crafts as may be provided in the college

As in the other two programmes for industrial crafts teachers, one of the optional minor crafts is gardening. Since the student may be placed in a rural school as the only crafts teacher, this skill and knowledge, if opted by the student, will help broaden the crafts offering of that school.

TABLE 13

ONE-YEAR CERTIFICATE INDUSTRIAL CRAFTS TEACHER EDUCATION PROGRAMME

Subject	*Periods per week*
Engineering Drawing	3*
Woodworking	10*
Metalworking	10*
Electricity	6*
Minor Craft***	6*
Principles of Craft Education	3*
Methods of Teaching Industrial Crafts	5*
Internship in Teaching	(6 week block)
Health and Physical Development (mornings only)	3**
Independent study	2
Total Periods/Week	48

*Subjects common with Three-year diploma and Two-year degree programmes.

**Common with Two-year degree and One-year degree programmes of the colleges.

***To be selected from Ceramic, Leatherwork, Printing or Gardening and such other crafts may be offered by the college.

SCHEME OF EXAMINATION FOR THE THREE-YEAR DIPLOMA PROGRAMME IN INDUSTRIAL CRAFTS

Subject	*No. of Papers*	*Marks*		*Total*
		Internal	*External*	
	GENERAL EDUCATION			
	I Year			
English	1	25	75	100
Applied Mathematics and Science	3 theory	25 25 25	75 75 75	300
	1 practical	25	25	50
Design and Creative Art Activities	1 theory	25	75	100
	1 practical	25	25	50
	II Year			
English	1	25	75	100
Regional Language	1	25	75	100
Applied Mathematics and Science	3 theory	25 25 25	75 75 75	300
	1 practical	25	25	50
Design and Creative Art Activities	1 theory	25	75	100
	1 practical	25	25	50
	III Year			
English	1	25	75	100
	PROFESSIONAL EDUCATION			
	I Year			
	- Nil -			
	II Year			
Principles of Craft Education	1	25	75	100
General Psychology	1	25	75	100
	III Year			
Educational Psychology	1	25	75	100
Methods of Teaching Industrial Crafts	1	25	75	100
Internship	-	300	-	300
	CONTENT			
	I Year			
Engineering Drawing	-	50	-	50
Woodworking	-	100	-	100
Metalworking	-	100	-	100
Electricity	-	50	-	50

Subject	*No. of Papers*	*Marks* Internal	External	*Total*
	II Year			
Engineering Drawing	1	25	75	100
Woodworking	–	100	–	100
Metalworking	–	100	–	100
Electricity	–	50	–	50
	III Year			
Woodworking	1 theory	25	75	100
or				
Metalworking	1 practical	100	100	200
Electricity	1 theory	25	75	100
	1 practical	100	100	200
Minor Craft I	–	50	–	50
Minor Craft II	–	50	–	50

SCHEME OF EXAMINATION FOR THE TWO-YEAR DEGREE PROGRAMME IN INDUSTRIAL CRAFTS

PROFESSIONAL EDUCATION

	I Year			
Principles of Craft Education	1	25	75	100
	II Year			
Psych. Foundations	1	40	110	150
Soc. and Phil. Foundations	2	25 25	75 75	200
Workshop in Teaching	1	25	75	100
Methods of Teaching Industrial Crafts	1	25	75	100
Internship	–	300	–	300
	CONTENT			
	I Year			
Engineering Drawing	–	50	–	50
Woodworking	–	100	–	100
Metalworking	–	100	–	100
Electricity	–	100	–	100
Minor Craft I	–	50	–	50
Minor Craft II	–	50	–	50
	II Year			
Engineering Drawing	1	25	75	100
Woodworking	–	100	–	100
Metalworking	–	100	–	100

SCHEME OF EXAMINATION FOR THE ONE-YEAR CERTIFICATE PROGRAMME IN INDUSTRIAL CRAFTS

Subject	*No. of Papers*	*Marks*		*Total*
		Internal	*External*	
	PROFESSIONAL EDUCATION			
Principles of Crafts Education	1	25	75	100
Methods of Teaching Industrial Crafts	1	25	75	100
Internship	–	300	–	300
	CONTENT			
Engineering Drawing	–	50	–	50
Woodworking	–	100	–	100
Metalworking	–	100	–	100
Electricity	–	100	–	100
Minor Craft	–	50	–	50

SYLLABUSES FOR THE INDUSTRIAL CRAFTS PROGRAMMES

The following syllabuses have been prepared and are included in the description of the Four-year Degree Programmes :

English
Regional Language
Engineering Drawing (First and second years)
General and Educational Psychology
Internship in Teaching
H P E and R (Mornings and afternoons)

The following syllabuses are included with the description of the One-year Degree Programmes :

Psychological Foundations
Social and Philosophical Foundations
Workshop in Teaching
Internship in Teaching
Health and Physical Development (Mornings only)

The following syllabuses are presented in this section :

Principles of Craft Education
Methods of Teaching Industrial Crafts
Applied Mathematics and Science
Design and Creative Art Activities
*Woodworking
*Metalworking
*Electricity
Ceramics
Leatherwork
Printing
Gardening

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*These syllabuses will be divided by each college staff depending upon the needs of students in the three types of industrial crafts programmes.

SYLLABUSES OF PROFESSIONAL SUBJECTS

SYLLABUS OUTLINE

PRINCIPLES OF CRAFT EDUCATION

1. Philosophical and Historical Bases of Crafts in India
2. Sociological Bases of Crafts in India
3. Economic Structure of India and the Position of the Crafts
4. Craft Organisations in India
5. Historical Development of Crafts Teaching in India
6. The Place of Crafts in the School Programme
7. Home and Community Improvement through Crafts
8. Present Status of Crafts in Indian Schools
9. Nature of Typical School Programmes at all Levels
10. Similar Programmes in Other Countries of the World
11. Physical Facilities, Equipment and Staff
12. Major Issues and Trends Craft Education

SYLLABUS OUTLINE

METHODS OF TEACHING INDUSTRIAL CRAFTS

1. The Teaching-Learning Process*

   Learning as a Part of the Developmental Process
   Individual Differences in Learning
   Readiness and Learning
   Motivation and Goal-Oriented Behaviour
   Incentives, Rewards and Punishments
   Progress in Learning - Learning Curves
   Retention and Transfer
   Socialisation and Learning
   Learning and Practice (Manipulative and Cognitive)
   Part versus Whole Learning
   Teacher's Role in Teaching-Learning Process

2. Selection and Organisation of Subject Matter

   Use of Syllabus - Strengths and Weaknesses
   Need for Constant Syllabus Revision and Improvement
   Sources of Subject Matter (Engineering, Industry, Trades)
   Developing a Statement of Educational Philosophy
   Establishing Specific Course Objectives
   Analysing Courses for Operations and Processes
   Analysing Courses for Related Information
   Selecting Jobs, Projects, Experiments or Problems
   Assembling the Course of Study or Syllabus

3. Methods of Teaching Skills and Related Information**

   Class and Small Group Demonstrations
   Individual Demonstrations and Remedial Help
   Illustrated Lectures (Classroom and Shop Talks)

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*This unit will be treated more thoroughly with students in the One-year Certificate Programme. Only an abreviated period of time should be spent with Three-year Diploma and Two-year Degree students since they have educational psychology in these programmes.

**Much of this section should be presented under simulated conditions in a workshop and class-room.

Lecture-Discussions
Discussion
Experimentation and Problem Solving
Project Method
Printed Instruction and Textbook Method
Directed Self Study
Student Reports and Demonstrations
Teaching Steps-Preparation, Presentation, Application and Testing

4. The Teaching Plan
   Lesson Objectives
   Selecting Content for Lessons
   Relationship of Lessons to Complete Course
   Sequence of Lesson
   Comprehensive or Detailed Lesson Plan
   Abbreviated or Skeleton Lesson Plan
   Unit Plan
   Project Plan
   Daily Plan
   Weekly and/or Monthly Plan
5. Written Instruction Sheets
   Use of Instruction Sheets
   Job Sheets
   Operation Sheets
   Information Sheets
   Assignment Sheets
   Principles of Writing Instruction Sheets
6. Class Organisation and Management
   Records of the Teacher
   Opportunities for Student Leadership
   Student Personnel Organisation
   Factors that Determine the Kind and Extent of an Organisation
7. Pupil-Teacher Planning
   Philosophy of Pupil-Teacher Planning
   Factors That Determine the Kind and Extent of Planning
8. Audio-Visual Materials
   Available Services and Resources
   Slide and Filmstrip Projector
   Motion Picture Projector
   Teaching Machines and Programmed Instruction
   Other Specialised Equipment

Charts, Models and Mock-ups
Use of Bulletin Board Displays
Teacher and Pupil-Made Materials
Free and Inexpensive Literature
Field Trips and Observations

9. Safety and Health

Importance of Safety Instruction
Conditions Causing Accidents
Maintaining a Safety Programme
Specific Means of Protecting Pupil, Teacher and School
Teacher Liability

10. Evaluating Pupil Achievement

System of Individual Cumulative Records
Maintain a Marking System - Recording Progress
Performance Testing in the Workshop
Evaluation of Jobs, Experiments and Projects
Uses of Written Tests
Measuring Problem-Solving Ability
Essay-Type Questions - Characteristics and Use
Objective-Type Questions - Characteristics and Use
Use of Progress Charts
Pupil Participation in Evaluation - Kind and Extent
Reporting Progress to School Officials and Parents

11. Vocational Guidance through Crafts

The School Guidance Programme
Role of the Crafts Teacher
Guidance through Group and Individual Instruction
Vocational Counselling
Occupational Information
Placement and Follow-up

12. Co-Curricular Activities

Full Responsibility as a Professional Teacher
Student Clubs and Activities
Displays and Exhibits
Other Responsibilities

13. Scope of Service and Future Opportunities

Teaching as a Profession
Comparison with Industry and the Trades
Outlook for the Future

Advanced Education and Training
Promotion and Advancements

14. Observation and Participation in Schools

Observation of Classroom and Workshop Activities
Assisting Individual Pupils
Making Case Studies of Pupils
Giving a Demonstration to the Class
Teaching a Related Lesson to the Class
Evaluating Pupil Learning and Teaching Effectiveness
Consultations with Teacher in Charge

SYLLABUSES OF ANCILLARY SUBJECTS

SYLLABUS OUTLINE

APPLIED MATHEMATICS AND SCIENCE

Mathematics—Year-I

ALGEBRA

Use of symbols, signs, monomials, polynomials, algebraic operations, fractions.

First degree equations, one or two unknowns ; practical problems.

Graphical representation, practical applications.

Progressions, arithmetical and geometrical, practical applications.

Decimal logarithms. Tables.

Slide rule. Practical problems.

GEOMETRY

Straight line, plane. Measurement of length. Instruments.

Angles. Measurement of angles. Instruments.

Triangles, applications.

Parallel lines and applications. Symmetry.

Circle, properties.

Applications to technical drawing.

Loci.

Similarity, metrical relations. Polygons.

Conical sections, elementary properties, construction.

Area.

Mathematics—Year-II

Elementary trigonometry. Definition of circular functions, fundamental relations, right-angled triangle relations. Tables. Simple applications to height and distance problems.

Solid geometry. Planes, lines, solid angles, polyhedrons. Sphere cone, cylinder.

Area and volumes.

Practical problems.

Applications to technical drawing.

PHYSICS

This subject gives a connected account of the properties of matter; statics, dynamics, heat, magnetism, with less emphasis on light and sound. The following topics are dealt with :

Year-I

a. Mechanics. Units and measurements. Motion, velocity, acceleration. Statics-forces, equilibrium, vectors, triangle and polygon of forces, simple structures, parallel forces, centre of gravity, weight, moments. Dynamics-intertia, tractive effort, torque, transmission by shafts, belting or gearing work, potential and kinetic energy, centrifugal and centripetal forces. Resistance, friction, ball-bearings.

b. Simple machines. Lever, inclined plane, wheel, and axle, screw, pulley, wedge. Ideal and real machines ; efficiency.

Simple idea of compound machines—like bicycle, weighing machines, pulley block. Time measurement, pendulum clock.

c. Mechanical properties of materials. Strength and elastic moduli, limits, elongation hardness, deformation, stress and strain, simple explanations of bending moment, and shearing forces.

d. Hydrostatics and hydrodynamics. Pressure, Archimede's Principle, density, hydraulic press, atmospheric pressure, barometer, manometers, Boyles law, vacuum pumps.

Year-II

a. Heat. Conservation of energy and the mechanical equivalent of heat. Calorific value of fuels.

b. Electricity—potential difference. Idea of electric current, electromotive forces, resistance, Ohm's law, cells and accumulators as source of electric current, heating effect. Joule's law, chemical effect of current (with reference to electrolysis) and electroplating.

Magnets—natural and artificial magnets, laws of attraction, repulsion, laws of force, induced magnets, magnetic field.

Magnetic effect of electric current—electromagnets—bell and simple telegraphy.

Interaction between current and magnets—electromagnetic induction, Faraday's and Lenz's laws.

Alternating current—properties as compared with those of direct currents—intensity, power, work, power factor, phase, self induction, capacity, inductance.

c. Simple principles of light and optics, practical applications.

d. Simple principles of sound—practical applications.

CHEMISTRY

This subject should give a grounding in elementary chemistry developed to include some important technical processes and to give a fuller understanding of engineering materials. The following topics are treated :

Year-I

The structure of matter—atoms and molecules, Dalton's atomic theory, simple principles of atomic structure, symbols, formulas and simple equations.

Classification of elements.

Acid, bases and salts—common methods of preparation, electrolysis.

Rudiments of metallurgy, ore smelting.

Properties and uses of—Iron and steel, Cu, Zn, Pb, Al, Sn.

Simple properties and industrial uses of the following elements :

C, Si, V, Cr, Mn, Ni, Mo, W, Hg and Mg.

Alloys—gunmetal, bronze, brass, stainless steel, soda amalgum, magnelium, and duralumin—their composition and uses. Corrosion and its protection, anti-corrosion protection.

Year-II

Developing and fixing a photographic plate.

Elements of organic chemistry—hydrocarbons, acetylene, formaldehyde.

Rubber and plastics.

Refinement of petroleum.

Fuels, industrial fuel gases, simple description.

Lubricants, simple description.

Glass—its manufacture, different varieties of glass, cement, firebricks, refractories.

Simple description of synthetic fibres (rayon, nylon, dacron, and dyes).

Description of paints, varnishes and other finishes. Spontaneous combustion.

Note : Simple practical laboratory work should be done in Physics and Chemistry both in year I and II.

SYLLABUS OUTLINE

DESIGN AND CREATIVE ART ACTIVITIES

Year I

1. The Work of the Creative Designer
   - Study of the Work of Prominent Designers in India and Abroad
   - Field Trips to Emporia and Industry and Guest Lectures on Design as it is Practised by Designers
   - The Need for Design Talent in the Craft Teacher
   - The Need for Design Talent in Individuals and How to Discover and Develop Talent
2. Evaluation of Design
   - Functional Adequacy
   - Advantageous and Inventive Use of Materials
   - Visual Organisation, Proportion, and Balance
   - Colour and Enrichment
   - Craftsmanship
3. The Design Process
   - Define the Problem or Need
   - Develop Tentative Solutions
   - Study the Available Tools, Materials, and Processes
   - Considerations for Mass Production
   - Make a Pilot Model
   - Evaluate and Redesign
4. Group Work in Evaluating Traditional Designs and Group Solutions for Improved Designs
   - Graphic Designs
   - Textile Designs
   - Three Dimensional Design as Appplied to Products and Enclosures

Year II

1. Individual Problems in Graphic and Textile Design
   - Posters
   - Greeting Cards
   - Book Covers for Frontispieces

Table Coverings
Wall Hangings
Bush Shirt or Blouse

2. Individual Problems in Three Dimensional Design

Common Wooden Objects
Common Objects of Metal
Lamps and Lighting Fixtures
Plastics and Leather
Ceramics

SYLLABUSES OF INDUSTRIAL CRAFTS

General

Industry and industrialisation will characterise the future environment of school students of today. Therefore it is only logical that students should study a craft that is industrial in nature so that they will be able to cope with their new and changing world. Industry is a vast and broad source of content for school study. Only selected areas that are capable of being easily provided for in the schools have been chosen. Other areas of industrial crafts study may be added to the programme when facilities and staff warrant. Each college may develop minor or subsidiary crafts with special reference to the locality.

Syllabuses in a draft form are presented for ceramics, electricity, leatherwork, metalwork, printing, and woodwork. Each syllabus is divided into two major divisions of subject matter ; namely, (a) operations and processes (practice) and (b) related information (theory). The sequence in which topics are listed in practice or in theory is not, however, of particular significance. For example, the teacher may rearrange the topics within the operations and processes (practice) to suit his pattern of instruction. It is important, however, to teach those theory portions of the syllabus that relate to shop practice at the time they are most appropriate, i.e. at the time of greatest student need and interest.

Carefully selected projects (complete and useful as opposed to exercises) should be required of the student in the initial stages of instruction. These projects may be teacher planned and designed to introduce the students to the basic skills and related information of the craft or trade. After the initial projects the student should be encouraged to design and construct more advanced functional projects in the medium. If the projects are carefully analysed and approved by the teacher, each student should be certain of covering the manipulative and cognitive portions of the syllabus adequately.

SYLLABUS OUTLINE

CERAMICS (INDUSTRIAL CRAFT)

POTTERY AND TILE

OPERATIONS AND PROCESSES. Sketching and planning ; conditioning clay ; processing native clays ; pinch forming ; wedging clay ; slab froming ; tile making ; press moulding; plaster casting ; slip preparation ; slip casting ; coil building ; free forming ; throwing on potter's wheel ; decorating moist or green ware ; decorating bisque ware with under-glaze and glaze ; kiln-loading and firing ; finishing glazed pieces.

RELATED INFORMATION. Principles of design ; properties of clay, types, qualities and composition ; tools used in pottery and tile making ; ceramic products, earthenware, stoneware, china and porcelain ; primitive and modern pottery and tile production ; history of potter's wheel ; major ceramic industrial centres ; occupations in the ceramics industry ; how glazes are made and their classification ; types of kilns ; safety in the shop ; principles of selecting commercial products.

CONCRETE AND MASONRY

OPERATIONS AND PROCESSES. Sketching and planning ; preparing forms for concrete ; estimating materials ; mixing concrete ; colouring concrete ; reinforcing concrete ; pouring concrete ; finishing concrete surfaces by striking off and using wooden floats and steel trowels ; making plain and expansion joints ; removing forms and rubbing in ; patching concrete.

Mixing mud, lime and cement mortar ; determining and testing for bond ; bedding joints in stretcher courses ; making head joints in stretcher courses ; making cross joints in header courses ; making closure joints in header and stretcher courses ; settting joints with irregular stone ; finishing joints : cleaning brick and stone surfaces.

RELATED INFORMATION. Tools of the concrete worker ; materials used for concrete ; mixing ratios ; colouring pigments ; principles of curing concrete ; special finishes such as cement wash, stucco and formimparted ; damp proofing ; material estimation ; tensile and compressive strength ; steel reinforcement.

Tools of the brick and stone mason ; varieties and uses of stone, quarrying and dressing ; varieties and uses of bricks, tile and concrete masonry units, manufacture and strength ; cements and mortars, varieties and manufacture ; safe masonry and concrete practices ; elementary principles and types of bonding ; occupations in concrete and masonry trades and related industries.

SYLLABUS OUTLINE

ELECTRICITY (INDUSTRIAL CRAFT)

OPERATIONS AND PROCESSES. Sketching and planning ; reading drawings with electrical symbols ; producing static electricity ; measuring the voltage and current output of a dry cell ; constructing temporary and permanent magnets ; constructing an electromagnet ; constructing and using a compass ; tracing magnetic paths using iron filings and compass ; testing an electromagnet with a compass for polarity when carrying direct current and when carrying alternating current ; connecting simple electrical circuits in series and in parallel ; measuring voltage in a circuit ; measuring amperage in a circuit ; measuring resistance in a circuit and resistance of components ; determining wire size with wire gauge ; cutting and bending wire ; stripping, cleaning, identifying, and labeling wire; making connections; soldering connections and taping wire ; making solderless connections ; connecting a bell and push button switch to a doorbell transformer ; winding or rewinding step-up and step-down transformers ; making coils ; cleaning, adjusting, testing and repairing series, split-phase, capacitor, repulsion-induction, and induction motors ; reading an electric kilowatt-hour meter ; calculating cost of consumed electricity ; measuring power required by heat-producing and motor-driven appliances ; repairing defective household appliances such as heater, fan, electric iron, or hot plate ; installing a branch circuit, open and enclosed in conduit ; installing switch gear and protective fuses ; installing or replacing a wall switch controlling one light or a group of lights ; installing or replacing a wall convenience outlet ; replacing an incandescent light fixture ; replacing a fluorescent lamp, starter, and fixture ; cleaning, filling and connecting a storage battery to a battery charger ; trouble-shooting an automobile electrical system including repairing a generator ; drawing the circuit and constructing a crystal radio ; constructing a singleband radio receiver ; testing and repairing radio receivers including a super-hetrodyne receiver ; using specialised meters and test equipment ; electroplating.

RELATED INFORMATION. Electricity as a servant of mankind ; historical development of electricity and electronics ; nature and effects of static electricity ; conductors and insulators ; temporary and permanent magnets ; earth's magnetic field ; electromagnets and electromagnetic induction ;

electron theory ; direct and alternating current ; series and parallel circuitry ; printed-wiring circuits ; voltage, amperage, resistance, and capacitance ; Ohm's law and its applications ; types of special tools of the electrician ; sources of electrical supplies; special meters and test instruments; common tests and measurements ; generation of electricity including description of power plant steam turbine and diesel generators and hydro-electric power ; generation of electricity from chemical sources, cells and batteries ; other devices that produce electricity by the following processes : photoelectricity, thermoelectricity, piezoelectricity, and bioelectricity ; transmission of electricity using transmission towers, high voltage lines, circuit breakers, and transformers ; distribution of electricity involving sub-stations and primary and distribution transformers, utilisation of electricity in the home and industry—lighting, motors, heating appliances, refrigeration and air conditioning, automobile, welding, electroplating and communications involving telegraph, telephone, radio, television, and radar ; measurement of watts, kilowatts and kilowatt hours ; theory of electron valves and semi-conductors (single treatment only) ; description of television ; safe work practices in electricity ; electrical code requirements for home wiring ; selection of commercial electrical products ; occupations in electricity and electronics.

SYLLABUS OUTLINE

LEATHERWORK (INDUSTRIAL CRAFT)

OPERATIONS AND PROCESSES. Sketching and planning ; designing a project ; making templates ; laying out on skins, kips, hides and scraps ; cutting leather from direct layout or templates ; sharpening and conditioning leather cutting tools ; preparing leather for work by sponging or casing ; transferring designs to leather ; tooling and modelling ; stippling and embossing ; set stamping ; incising or carving ; filigree carving ; colouring and finishing leather surfaces ; skiving ; finishing edges of leather with edge tools ; folding and stretching leather ; punching holes in leather ; setting snaps and other attachments ; cementing linings ; sewing ; lacing using several common stitches ; splicing lace ; braiding ; preserving leather goods.

RELATED INFORMATION. Tools used by the leather craftsman ; brief history of leather in India and other countries ; survey of the leather industry in India ; curing, natural and chemical tanning and other industrial processes ; craft leather and animal sources ; principles of design and leather decoration ; types of dyes, stains and colouring agents ; leather preservatives and polishes ; sources of supply for the leather craftsman ; market for finished leather goods ; occupations in the leather industry ; principles of selecting and purchasing leather products.

SYLLABUS OUTLINE

METALWORK (INDUSTRIAL CRAFT)

BENCH FITTING

OPERATIONS AND PROCESSES. Sketching and drawing ; reading a working drawing ; writing a plan of procedure for a project ; preparing a bill of materials ; making simple measurements and layouts with rule, scriber, punches, divider, caliper, protractor, combination square, etc ; cutting metal with a hacksaw ; cutting and removing metal with various types of files, rough filing, smooth filing and drawfiling ; cutting and removing metal with a cold chisel ; bending cold metal in a vise ; twisting cold metal in a vise ; forming curves and scrolls with bending jigs and bending machine ; drilling holes in metal with a hand drill ; reaming holes with hand reamer ; cutting threads with tap and die ; cutting, reaming and threading pipe ; assembling threaded pipe fittings ; using abrasives to finish metal surfaces.

RELATED INFORMATION. Principles of designing bench metal projects ; common measuring and laying out tools, holding devices (vises and clamps) and common cutting and abrading tools, types, sizes, grades and special uses ; care and maintenance of equipment ; metals commonly used in bench fitting, characteristics, manufacture, types, sizes and grades ; metal fasteners, types, characteristics and manufacture ; safety and hygiene in bench fitting.

WELDING

OPERATIONS AND PROCESSES. Sketching and planning ; reading working drawings with welding symbols ; replacing and adjusting regulators on oxygen and acetylene tanks ; lighting and adjusting an oxyacetylene torch ; choosing the proper welding tip for the thickness of metal ; selecting correct welding rod for specific operations on different kinds of metal ; joining metal together using various joints by the fusion method ; selecting proper fluxes for brazing and hard soldering ; joining metal together using various joints by brazing or hard soldering ; cutting metal with a cutting torch ; adjusting an electric arc welder ; striking and breaking an arc ; joining metal together using various joints by the arc welding process ; dressing a welded, brazed or soldered joint ; adjusting and using a spot welder.

RELATED INFORMATION. Principles of design related to projects involving welding ; tools and equipment used in the various types of welding, characteristics, sizes and special uses ; welding supplies, characteristics and sources of supply ; safe practices in welding ; care and maintenance of equipment ; proper methods of handling and storing welding equipment and supplies ; common welding joints ; common terms and processes in welding ; iron and steel alloys, characteristics and manufacture ; non-ferrous metals capable of being welded, characteristics and manufacture ; gas-arc (shielded arc) welding and other less common methods of welding ; miscellaneous welding problems and techniques.

FORGING AND HEAT TREATING

OPERATIONS AND PROCESSES. Sketching and planning ; reading working drawings ; building and maintaining a forge fire ; measuring and cutting cold stock ; holding work with tongs ; bending a piece of hot metal ; cutting a piece of hot metal ; upsetting stock ; drawing out stock ; fullering and swaging metal ; punching and enlarging holes in hot metal ; forming an open eye, a sharp angle corner and a head on bar stock ; shaping hot metal to different cross-sections ; forging a lapweld ; forging simple tools from tool steel ; annealing, hardening and tempering tool steel ; casehardening low carbon steel.

RELATED INFORMATION. Common tools and equipment used in forging and heat treating, characteristics and special uses ; care and maintenance of tools and equipment ; safe work procedures in forging and heat treating ; forge fuels and other supplies, characteristics and source of supply ; metal commonly forged and heat treated, characteristies, manufacture and identification ; elementary metallurgical principles of annealling, hardening, tempering and casehardening ; forging and heat treating practices in industry.

FOUNDING

OPERATIONS AND PROCESSES. Sketching and planning ; reading working drawings of the patternmaker ; charging a melting crucible ; firing a pit furnace; charging and firing a cupola ; testing molten metal for pouring temperature ; tempering sand ; riddling sand ; ramming sand ; making sand mould using solid pattern ; making sand mould using spilt pattern ; making a core mixture ; forming, baking and placing a core ; venting a mould ; cutting a sprue ; cutting a riser ; cutting a gate ; assembling a flask ; pouring molten metal (ferrous and non-ferrous) ; shaking out a casting ; cleaning a casting and removing gates ; making a hollow or slush casting.

RELATED INFORMATION. History of founding ; patterns used in the foundry, design and construction ; tools and equipment, characteristics and

special uses ; care and maintenance of tools and equipment ; alloys used in casting ; foundry supplies, characteristics and sources of supply ; elementary metallurgical principles involved in metal casting ; safety and health ; special terminology in founding and patternmaking ; occupations in foundry, special training and employment conditions and opportunities ; practices in large industrial foundries ; new developments and special processes ; Factory Acts applying to the metal industries.

SHEET METAL

OPERATIONS AND PROCESSES. Sketching and planning ; reading sheet metal development drawings ; making measurements and layouts with common rule, circumference rule, punches, dividers, calipers, protractor, combination square, etc. ; laying out and developing patterns for cylindrical, conical, and transition parts ; cutting straight and curved lines ; using compound lever shears and squaring shears ; cutting rings and circles ; bending sheet metal by the hand process ; bending sheet metal with a bar folder and/or pan brake ; making common sheet metal joints ; making a wired edge by hand and machine processes; forming sheet metal with forming, crimping, beading, and grooving rolls ; punching and drilling holes ; riviting joints and seams ; tinning a soldering iron ; soldering sheet metal joints ; sweating a soldered joint ; finishing sheet metal products.

RELATED INFORMATION. Design principles of sheet metal projects ; basic principles of sheet metal pattern development ; common tools and equipment used in sheet metalwork ; stakes used in forming sheet metal ; soldering devices and appliances ; sheet metal supplies and sources of purchase ; care and maintenance of tools and equipment ; metals commonly used in sheet metalwork, sizes, gauges, and manufacture ; sheet metal practices in small shops and large industry ; occupations in sheet metal and training required ; safety and health.

TURNING

OPERATIONS AND PROCESSES. Sketching and planning ; reading working drawings ; making a simple layout on workpiece ; checking and adjusting power features before mounting work ; locating and drilling centre holes ; mounting work between centres with dog and faceplate ; facing the ends with the workpiece held between centres ; rough turning between centres ; finish turning between centres ; installing a chuck and mounting the workpiece ; installing a collect chuck and mounting the workpiece ; facing, turning, and cutting off a workpiece mounted in a chuck ; drilling with a lathe ; boring with a lathe ; reaming with a lathe ; using a mandrel for turning ; knurling with a lathe ; filing and polishing ; turning tapers ;

cutting external and internal threads ; milling on a lathe ; cleaning a lathe ; grinding tool bits.

RELATED INFORMATION. History of the lathe ; the modern lathe and its parts ; power train of a lathe ; work-holding attachments for the lathe ; cutting tools and toolholders ; speed, feed, and depth of cut ; calculations for cutting speeds and feeds, gear ratio for thread cutting, and taper turning ; metals and alloys used in turning ; safe work practices ; care and maintenance of lathe ; types of lathes in industry ; description of other machine tools such as drilling machines, milling machines, shapers, planers and grinders ; occupations in the machine tool field.

SYLLABUS OUTLINE

PRINTING (INDUSTRIAL (CRAFT)

BLOCK RELIEF PRINTING

OPERATIONS AND PROCESSES. Sketching and planning ; experimenting with simple block prints ; cutting a single-colour linoleum block ; printing a single-colour linoleum block ; cutting a single colour woodcut or engraving; printing a single-colour woodcut or engraving ; cutting linoleum block for two or more colours ; printing with linoleum blocks of two or more colours requiring registration ; block printing on textiles.

RELATED INFORMATION. History of block printing ; principles of design and decoration ; tools and equipment used in block relief printing ; inks and colours, manufacture and characteristics ; care and cleaning of equipment ; manufacture, treatment and use of linoleum ; commercial applications of block relief printing ; sources of block printing spplies ; storage of supplies ; safety and hygiene in block printing.

SCREEN PROCESS PRINTING

OPERATIONS AND PROCESSES. Sketching and planning ; cutting and adhering a hand-cut lacquer film stencil ; printing from stencil with silk screen frame ; adding flock and other textures to image ; storing prints on drying racks ; cleaning stencil and printing frames ; removing stencil from silk ; attaching new silk to printing frame when required ; maintaining squeegee and other equipment ; preparing stencils by the tusche and glue method ; preparing a shellac-coated paper stencil ; cutting stencils for two or more colours ; printing multicolour images involing accurate registration ; screening on textiles and glass.

RELATED INFORMATION. Origin and history of screen process printing ; principles of design and decoration ; artwork and lettering styles ; tools and equipment used in screen process printing ; major stencil methods including paper stencil method, tusche and glue method, show card mixture method (for reverse printing), indirect photographic method, direct photographic method and lacquer film stencil method; inks and colours - characteristics and manufacture ; colour principles and pigment combination ; care and maintenance of tools and equipment ; sources of supplies such as silk screen bolting cloth, organdy, taffeta, inks, oil process paints, flock, reducers, retarders,

extenders, etc. ; proper storage of supplies ; advantages of screen process printing ; commercial applications ; plans and procedures for making home-made equipment ; extent of the screen process industry in India and other countries ; safety and hygiene in screen process printing.

LETTER-PRESS PRINTING

OPERATIONS AND PROCESSES. Learning the arrangement of letters, numerals, etc. in type cases ; planning a job and making a layout ; setting composing stick to a measure ; assembling type in a composing stick ; correcting errors in composing stick ; quading out a line of type to justify ; centering a line of type ; spacing a line of type, in or out, to be flush on both sides and justified ; removing type from composing stick ; tieing or binding a form in a galley ; taking a proof ; replacing type line in composing stick for correction ; making corrections in the galley ; inking the slab ; inking the form for proofing ; pulling a proof on the proof press ; pulling a planer proof ; reading and marking a proof using standard proof reader's symbols ; cleaning the proof press ; cleaning the type form ; removing form from galley to stone ; locking up by squared-up and chaser methods ; setting up a platen press ; inking up the platen ; making the press ready ; feeding the press ; cleaning the press ; cleaning type face in the form ; unlocking and breaking up a type form ; distributing type into type case ; distributing leads, slugs, rules, reglets and furniture ; sorting pied type ; cleaning a typecase.

RELATED INFORMATION. History of letter-press printing - invention of movable type ; contribution of printing to civilisation ; art principles of composition, balance, symmetry, proportion, harmony etc. ; purposes and preparation of layout ; families and styles of type-classification to type faces ; manufacture of type ; parts of foundry type ; kinds of furniture, spacing materials etc. ; point system of type measurement ; standard procedures for reading and marking proof ; capitalisation and word division ; rules for punctuation ; care and maintenance of equipment ; proper storage of supplies and cleaning materials ; safety and hygiene in the print shop ; comparisons of major printing processes, i.e. relief, intaglio and planographic ; composition and manufacture of printing inks ; the printing and publishing industry in India and other countries ; occupations in the printing industry, employment requirements, qualification and opportunities ; advanced training opportunities in printing ; considerations in estimating job costs ; factors involved when ordering or buying printed materials ; kinds and types of printing machinery including typecasting and typesetting equipment ; wooden type, characteristics and use ; use of colour in printing ; halftones, their nature, manufacture and use ; technical terms used in printing.

STOCKWORK AND BINDERY

OPERATIONS AND PROCESSES. Counting, jogging, piling, protecting and handling paper; cutting paper; punching paper; drilling paper; folding sheets; gathering sections; making a paper pad; biding a book in paper or leather by preparing end papers, preparing signatures or loose sheets for sewing, sewing the book, glueing the book, making the cover, preparing sewed book for cover and casing book and cover; decorating cover; marbleising book edges or sheets of paper; rebinding a book; making paper on miniature scale.

RELATED INFORMATION. Origin and history of bookbinding; tools and equipment used in stockwork and bindery, size characteristics and use; care and maintenance of tools and equipment; safe practices in stockwork and bindery; styles and types of bindings; proper storage of supplies; sources of supplies in bookbinding; the paper making process; characteristics of paper, sizes, weights and substance; sources of paper-making materials; proper care of books.

SYLLABUS OUTLINE

WOODWORK (INDUSTRIAL CRAFT)

OPERATIONS AND PROCESSES. Sketching and drawing ; reading a working drawing ; preparing a bill of materials ; calculating board feet or cubic feet ; planning a procedure for a project ; measuring with a rule ; laying out work on stock ; gauging with marking gauge and pencil and fingers ; adjusting a jack plane and smooth plane ; planing a true surface and a square edge, ; testing with a try square ; adjusting a block plane ; planning end grain true and square ; sawing to a line with crosscut saw, ripsaw and backsaw ; cutting irregular curves with a coping (fret) saw ; using rasp and other files for shaping and smoothing surfaces ; cutting with spoke-shave ; chipping, gouging and inlaying ; drilling holes with hand drill ; countersinking and counterboring holes ; boring holes with brace and bit ; fastening with wood screws ; trimming and paring with chisel ; smoothing surfaces with abrasive paper ; holding stock with hand clamps ; making an edge-to-edge glue joint without and with dowel pins ; prepariug and applying glue ; clamping up stock ; cutting bevels and chamfers ; laying out and testing cuts with sliding T bevel ; laying out and cutting common structural joints such as butt, mitre, half-lap, end lap, dado, gain, groove, rabbet, mortise and tenon ; sharpening edge tools ; maintaining tools such as dressing a screw driver or auger bit ; driving and drawing nails ; setting nails and brads ; smoothing a surface with a hand scraper ; filling holes and wood defects ; sanding a surface in final preparation for finishing ; applying finishes such as fillers, stains, shellac, varnish, paint, wax ; cleaning and caring for brushes, applying finish with a spray gun ; attaching hardware such as locks, hinges and handles. Operating, adjusting and maintaining such power machines as the drill press, circular saw, jointer, planer-thicknesser, sander, jig saw, band saw and wood lathe. Operating, adjusting and maintaining portable electric tools such as the drill, router and sander. Performing typical machine operations representing the range of work that can be done on each.

RELATED INFORMATION—Principles of designing wooden products ; tools and machines of the woodworker, characteristics, types, sizes, grades and special uses ; safety with tools and machines ; care and maintenance ; botany and growth of trees; identification of selected common woods used in pattern-

making, furniture making, cabinet making and carpentry ; principal characteristics, chief uses and sources of supply of selected common lumber ; the lumber industry and conservation ; milling operations ; effect of moisture on lumber ; seasoning of lumber ; manufacture and caracteristics of veneer, plywood and particle board, types of wooden foundry patterns and their construction ; common types of wooden furniture and their construction ; characteristics and types of wood construction in cabinetmaking and carpentry ; manufacture, types and grades of abrasive paper ; types, uses and preparation of wood glues ; major woodworking joints, identification and structural application ; major purposes of wood finishing (decoration, preservation and sanitation) ; kinds of wood finishes in common use such as fillers, stains, oils, shellac, varnish, synthetic lacquers, paints and wax ; manufacture and durability of finishes ; solvents and thinners ; techniques of application ; proper storage of finishes and management of finishing room ; types of spray guns, use of spray booth, techniques of spray finishing and care of equipment ; types, sizes and manufacture of common fasteners such as nails, brads, screws and other hardware including hinges and locks ; occupations in the lumber industry ; opportunities in the various woodworking trades ; principles of purchasing commerical products of wood.

SYLLABUS OUTLINE

GARDENING (AGRICULTURAL CRAFT)

A. Introduction to gardening

1. The importance of gardening as a means of enriching the family food needs, considering economic and dieting factors.
2. Determining the food needs of a family and the extent to which a home garden will meet them.

B. Selection of varieties of plants to grow in the garden

1. Identification of common garden crops and comparison, based on food value, yield soil and water requirements, time of harvesting.
2. Selection of kinds of garden crops for a specific gardening situation.

C. Planning the garden layout

1. Selecting the site location considering such factors as soil type, topography, irrigation facilities, drainage, exposure, protection from damaging elements.
2. Determining the size of the garden considering the food needs.
3. Determining the plots in the garden.

D. Preparing the seedbed

1. Characteristics of ideal seedbed.
2. Relationship of type of seedbed to the garden crop raised.
3. Seedbed preparation practices.
4. Selecting and implementing seedbed preparation practices for specific gardening situations.

E. Fertilization

1. Determining nutrient needs of garden crops.
2. Determining the soil nutrient inventory of garden soil.
3. A comparison of sources of plant nutrients, including organic and inorganic fertilisers.
4. Determining the kinds and amount of fertilisers to apply to garden crops.

F. Planting garden crops
   1. The relationship of effective planting practices to efficient garden crop production
   2. Principles of planting the various types of garden crops
   3. Selection and implementation of planting practices, such as time of planting, rate of planting, placement of seeds, depth of planting.

G. Raising seedling
   1. Location of the nursery
   2. Seedbed preparation
   3. Soil treatment
   4. General management practices

H. Irrigation practices
   1. Water requirements of garden crops
   2. Methods of irrigation for garden crops
   3. Selecting and implementing specific irrigation practices

I. Cultivation and weed control
   1. Principles of garden crop cultivation
   2. Specific practices for garden crop cultivation

J. Control of insects, diseases and pests
   1. Identification of common insects, diseases and pests of garden crops
   2. Symptoms, preventive and control measures for insects, diseases and pests of garden crops

K. Harvesting, storing, marketing of garden crops
   1. Factors to consider to determine whether to store or market garden crops
   2. Methods of harvesting garden crops
   3. Methods of storing garden crops
   4. Marketing practices such as sorting and packing of garden products

PROFESSIONAL EDUCATION

SYLLABUS-BLOCK-OF-TIME FOR SCIENCE

In teaching of Science, the fundamental aim should be to involve the pupils in the processes and procedures through which a practising scientist works. Science teaching is not imparting of facts *about* science but *doing* science. The programmes for the training of teachers of science are designed to develop in the prospective teacher this attitude of mind and the skills and knowledge that should go with it.

The Regional Colleges of Education offer two types of training programmes for prospective science teachers : a four-year course which integrates the subject content with professional preparation and, secondly, a one-year course for students who have at least a graduate degreee in science.

The four-year integrated course which is a departure from the existing pattern of training science teachers for secondary schools is designed in the conviction that the insight and understanding of the most effective methods of teaching science are intimately linked to, and arise naturally from the processes by which scientific knowledge is acquired and that no division of responsibility can be made for the teaching of subject content and the teaching of methods, without impairing the effectiveness of the training programme for the prospective teacher. This interweaving of the courses in science with professional training is an essential feature of the four-year programme. It is to be organized and carried on as an *integrated* course and not as two parallel courses spread over four years.

Since the four-year course has yet to become the general pattern for the training of science teachers of secondary schools, provision has been made in the Regional Colleges for a one-year course also for students with a graduate or postgraduate degraee in science. The one-year course, however, has been redesigned with the main stress on meeting the specific needs of teachers of science and, subject to the inherent limitations of the one-year course, to approximate the purposes which an integrated course would serve.

The teacher of science—his competencies

1. A teacher of science should have a command of the subject matter in breadth as well as depth.

Scientific knowledge, though divided into different branches, is a unified whole reflecting essentially the same processes and methods of enquiry at

work. Scientific advancement is tending more and more to merge the boundaries between different branches and the most significant work in science is taking place at the points where two scientific disciplines meet. They have been rightly called 'the growing points of science'. If the teacher in a secondary school is to have a proper appreciation of the advancing frontiers of scientific knowledge, he should have more than a passing acquaintance with the various fields of science. Without it his work will tend to be too narrow. From a practical point of view also, such preparation is essential ; the teacher would have to teach more than one science subject and also general science.

The teacher of science in a secondary school is, however, also a specialist teacher. A teacher's most stimulating teaching will be possible only if he has acquired a deep insight in his subject. It is the systematic mastery of the subject that enables a person to simplify his presentation without distortion. He alone can envisage the objectives of teaching his subject or the topics related to his subject in terms of fundamental concepts and principles.

2. The experimental approach is the distinction of scientific method. Teaching of science cannot be fruitful unless it is rooted in experimental and laboratory work. A teacher should, therefore, have a thorough and systematic grasp of experimentation and be capable of designing experiments at different levels of sophistication and using materials and equipment from the simplest to the relatively complex variety. He should be able to prepare more than one type of experiment or use more than one type of equipment in investigating a single scientific phenomenon. He should recognise the prime need for variety in laboratory work and have the capacity to design and develop it accordingly.

3. The teacher should have an insight into the essential relationship between laboratory or experimental work and the unit of subject content and he must be able to participate, design and develop the experiments in the way that he will teach his pupils to do. He should be able to assess the instructional value of any experimental material or media.

4. He should be able to organize various techniques of teaching into different combinations for developing an effective programme suited to the varying abilities of the pupils and the conditions in our schools—demonstrations, group experiments, individual experiments, field studies, discussions, observations in factories and workshops, etc.

5. He should have a high level of proficiency with workshop tools and techniques and be able to prepare simple science apparatus from indigenous material and repair and maintain scientific equipment.

6. He should be able to prepare and use various types of instructional materials and audio-visual aids.

7. He should have a good command of spoken and written language and of scientific terminology to guide his pupils in preparing and presenting reports and participate in discussions in correct and precise language.

8. He should be able to organize out-of-school science work, science clubs, scientific contests, science fairs, etc. and have an appreciation of the nature and needs of talented pupils, the way of identifying them and the types of programme within the curriculum and outside that can be organized for them.

9. He should have an understanding of the methods most appropriate to assess the progress and achievement of the pupils and to prepare appropriate tests for the purpose.

10. He should have the capacity for self-growth and receptivity to new ideas and techniques.

N.B. The paragraphs that follow deal mainly with one-year training course but the suggestions apply *mutatis mutandis* to the four-year integrated course also.

Teaching Method

Recognising that no single teaching method in science can be considered unquestionably superior to others and that the best results are obtained when a teaching method or a combination of different methods is adapted to suit the individual needs of the pupils and the conditions under which a school has to function, the teaching plan in the college will be so organized that the prospective teacher is trained to make the adaptations out of a knowledge of the possibilities of each method.

The programme will be closely linked to practice teaching (internship in teaching) in the demonstration and other schools.

In one-year course a total of 20 periods per week has been set aside for intensive study of subject matter and the methods most appropriate to teaching it. Teachers under training who show insufficient grasp of subject matter will be helped to make up the deficiency through guided study and laboratory work on holidays and Sundays.

Course

The course will consist of three major although closely related parts :

1. Subject matter content
2. Laboratory skills
3. Methodology

SUBJECT MATTER CONTENT

This phase of the programme is designed to give the student an introduction to two branches of science which he may not have studied earlier. Students will be divided into biological science and physical science groups

and will use the higher secondary syllabuses as the framework of their study of the respective science areas.

In addition, the programme will include an intensive study of the major scientific concepts and principles of the main branches of science through demonstrations, experimentation, reading and discussion. The material for the study will be selected with a view to :

a. showing inter-relationships and possibilities of integration ;
b. illustrating the unique methods of the discipline and their applicability to Indian life ;
c. using appropriate experiments, demonstrations and films in developing essential concepts ;
d. selecting assignments which develop the use of English and the regional language in the scientific context ;
e. involving students in preparing as many experiments as may be necessary for the study.

LABORATORY SKILLS

There will be a workshop attached to the science departments of the colleges and the trainees will gain specific skills in the workshop in the construction, repair and maintenance of laboratory equipment. Major units of the secondary school syllabus will be studied in depth, and the experiments and demonstration at different levels of difficulty and using different types of material will be prepared and developed. The experimental work will be treated as the heart of the programme of training.

METHODOLOGY

Unit 1. Objectives of Science Education

This unit should consist of assigned readings, lectures and discussions designed to produce in students an understanding of the following :

a. The changing nature of science education objectives—the concept that objectives grow out of the nature of science itself and out of the nature of different cultures.
b. Types of objectives : objectives can relate to cover such things as functional information or facts, concepts and understanding of principles, instructional skills, problem-solving skills, attitudes, appreciations, interests and changed behaviour.
c. Topics taught should be studied in sufficient depth and by appropriate experiments so that the learner comes to understand the pattern or structure of science as a discipline.

d. Students should get an understanding of the way scientists function.

Unit 2. Science Curriculum Planning

a. Principles of learning as applied to science teaching.

b. A study of the variety of reading material available for science teaching - textbooks, (criteria) scope and limitations of textbook, supplementary reference books, periodical literature, filmstrips, programmed instruction, etc.

c. Teacher-pupil planning.

d. Unit teaching in science.

e. A study of recent trends in preparing science curriculum for schools in other countries.

f. A study of typical science syllabi for General Science and for either the Biological Sciences or the Physical Sciences.

Unit 3. Instructional Materials

a. In this unit the methods as well as the materials should be dealt with. The use of instructional materials in their full range should be covered including the use of the library, the community resources and audio-visual media. The creation of instructional materials should be stressed.

b. Science laboratory—its design, furniture, maintenance of equipment, laboratory management and purchase of new equipment. Improvisation of teaching aids and apparatus.

c. The selection, care and repair of equipment and the selection, care and use of supplies.

d. The use of tools and materials in constructing improvised apparatuses.

e. How to use out-door resources, school garden, etc. as an extension of laboratory.

f. Use of other resources for science teaching—excursions, field trips, lectures, radio broadcasts, etc.

g. Setting up and maintaining an acquarium either in the college, science club or in some school.

h. The organization of science activities such as science club, and science fairs.

Unit 4. Introductory Units in Selected Sciences

This units is designed to give an introduction to certain branches of science that are seldom taught as secondary school subjects but are so

important that a well prepared teacher should know about them if he is to be an effective teacher. The following sciences will be studied :

Astronomy
Geology
Geography and
Meteorology

a. Each student will prepare and present with demonstrations a lesson in one of the sciences studied in this unit. Presentation may be to a committee rather than to the entire class if the group is too large.

b. Designing different experiments to demonstrate certain facts and concepts of selected units.

c. Preparing an annotated card file of literature on laboratory techniques, teaching methods and subject matter appropriate in the 'minor' sciences.

Unit 5. Guidance and Evaluation

A study of the guidance possibilities inherent in science teaching.

The possibility of discussion as an evaluative device should be considered. Experience should be provided in formulating questions which will reveal student understanding.

Practice should be provided in the formulation and use of objective based questions to test : facts, understanding of content, interpretation of data, application of principles, using data in measurement, ability to formulate hypotheses, awareness of assumption underlying conclusions and validity of data.

Unit 6. Internship

a. This unit should precede the internship experience. Observations in classrooms, review of purposes of internship, and community surveys are illustrative of activities to be used.

b. Internship is potentially rich in the kind of experiences it can provide. The real gains, however, come when the experiences are reviewed and evaluated systematically in the seminar discussions. (Student-teacher planning of this unit is essential).

Evaluation

Methods of teaching will be subject to internal evaluation (25 marks) and external evaluation (75 marks). The evaluation should be based on the syllabus and should utilise tests of knowledge as well as performance.

The evaluation of content will be entirely internal (100 marks) and will be individualised to a great extent since students will enter with wide differences in preparation. The common units may be commonly evaluated.

Internal assessment will be based on (a) practical activities such as the construction of apparatuses ; (b) periodical tests ; (c) workshop and laboratory skills ; (d) mastery of content ; and (e) skills in devising appropriate experiments, teaching aids and devices.

The evaluation of classroom performance (300 marks) will be entirely interal and will be based principally on teaching and laboratory performance in the classroom.

APPENDIX

REGIONAL COLLEGES PLANNING COMMITTEES

The following persons were members of the committees and working groups that were convened to help plan the programmes of the Regional Colleges of Education. They represent, however, only a partial list of individuals who have contributed to the programme. It is not possible to identify all persons who were interviewed, who assisted in the drawing up of furniture, equipment, and book lists and who have influenced the content of this report.

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