DOCUMENT RESUME

ED 063 516 VT 015 725

TITLE	Italy--The Education, Training and Functions of Technicians. Scientific and Technical Personnel.
INSTITUTION	Organisation for Economic Cooperation and Development, Paris (France). Directorate for Scientific Affairs.
PUB DATE	29 Sep 70
NOTE	113p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	Articulation (Program); Economic Development; *Foreign Countries; Job Analysis; *Job Training; Manpower Development; *Manpower Utilization; *National Surveys; Tables (Data); Teacher Education; *Technical Education; Vocational Education
IDENTIFIERS	Italy

ABSTRACT

To identity problems regarding economic development, the Committee for Scientific and Technical Personnel conducted an educational and occupational survey of each member country of the Organisation for Economic Cooperation and Development (OECD). The specific purpose of the surveys was to gather comparative data on the training and utilization of technicians in each member country. Major sections of each survey are: (1) The Structure of the Educational System, (2) Training of Technicians and Other Technical Manpower, and (3) Functions of Technicians. Related surveys for each of the following countries, Canada, Denmark, Spain, France, Netherlands, Switzerland, Yugoslavia, United Kingdom, and Portugal, are available in this issue as VT 015 716-VT 015 724 respectively. (JS)

OCDE
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SCIENTIFIC AND TECHNICAL PERSONNEL

THE EDUCATION, TRAINING AND FUNCTIONS OF TECHNICIANS

ITALY

DIRECTORATE FOR SCIENTIFIC AFFAIRS

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

1

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2, rue André-Pascal, Paris-16e

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

FOR GENERAL DISTRIBUTION

Paris, 29th September, 1970

English text only

DIRECTORATE FOR SCIENTIFIC AFFAIRS

COUNTRY REPORTS

ON

EDUCATION, TRAINING AND FUNCTIONS OF TECHNICIANS

ITALY

PREFACE

The OECD Committee for Scientific and Technical Personnel has given considerable attention to the question of technician training and utilization which is a key problem in the economic development of Member countries, and has on several occasions drawn attention to the need for an adequate supply of and proper training for skills at this level.

To clarify the situation as far as possible and to establish a solid base for discussion, the Committee has instituted a series of surveys in Member countries describing and analysing training conditions.

The material obtained is classified according to a standard pattern throughout, so that comparisons can be drawn between countries. The completed surveys were used as basic working documents for "Confrontation Meetings" between two or more countries. These meetings were held under a neutral chairman and were attended by teams of specialists from the participating countries. Delegates discussed each other's training systems and the various problems which arise and endeavoured to reach conclusions on questions of policy and to find solutions to technical difficulties.

The present publication, the twelfth of a series, was prepared by the OECD Secretariat, the responsibility being with Mr. S. Syrimis, Consultant to the Directorate for Scientific Affairs. It incorporates information already available at OECD and in particular in the original survey carried out by a joint FEANI/EUSEC(1) Committee, supplemented by on-the-spot investigation.

The Secretariat wishes to acknowledge its indebtedness to the Italian Authorities for their help and co-operation in the preparation of this report.

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(1) FEANI: European Federation of National Associations of Engineers.

EUSEC: Conference of Engineering Societies of Western Europe and the United States of America.

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Part I

THE STRUCTURE OF THE EDUCATIONAL SYSTEM

I. GENERAL DATA - THE PLACE OF TECHNICAL EDUCATION IN THE EDUCATIONAL SYSTEM

1. The Italian educational system is based on eight years compulsory schooling starting at the age of five. The present school structure is the result of a series of reforms, the most important of which are the "Gentile" reform of 1923 and the partially implemented "Bottai" reform of 1940. The laws of 21st July, 1961 (No. 685) and of 31st December, 1962 (No. 1859) provided for further integration of general and technical courses and for uniformity at the lower secondary level.

2. Compulsory education is free of charge and assistance is given by the Ministry of Education and other school welfare organisations in the form of text-books, meals, clothing, etc. To meet the needs of all the compulsory school-age population there are ordinary classes, classes for backward children, coaching classes (for children who are behind in their studies or development) and special classes (for physically or psychologically maladjusted children).

3. Technical and vocational education is, in its greater part, under the control of the Ministry of National Education, and is governed by the law No. 889 of 15th June, 1931, which has been revised and supplemented in November 1961. Technical courses start at the age of fourteen, that is after eight-years of basic education and comprise a two-year general cycle followed by three years of specialisation. Pupils completing these courses are admitted to certain university faculties. Similarly, vocational courses start at the same age and last two or three years.

4. Appendix 1/I illustrates, by means of a simplified diagram, the existing technical and vocational courses within the framework of the educational system which is briefly described below. Technical and vocational courses are further analysed under the appropriate headings in the text.

PRIMARY LEVEL

5. Primary education is provided in either "public primary schools", which are state schools or schools recognized and subsidised by the State, or in "private primary schools" which are administered by private institutions or individuals and may be fee-paying; it lasts five years and comprises a two-year cycle with a largely standardised curriculum and a three-year cycle with progressively differentiated programme. Upon completion of the second cycle and after passing an examination pupils are awarded a certificate, which qualifies them for the "middle school". Examinations are also held at the end of the first cycle.

LOWER SECONDARY LEVEL

6. Lower secondary education is given in the "middle schools" and completes the compulsory period. It lasts three years (ages 11 to 14) and has been unified since 1962 (Law No. 1859 of 31st December). Prior to this year, lower secondary education was provided in various types of schools such as the post-primary school, the middle school (old type), the vocational training school, the arts school, etc.

7. The curriculum of the "middle school" is of a general nature and includes, apart from the traditional subjects, instruction in a foreign language, practical exercises and some guidance for subsequent choice of school and occupation, and is supplemented by a few optional subjects. Upon completion of the school and after passing a state examination, pupils obtain a certificate qualifying them for admission to all types of upper secondary schools. However, to enter the traditional "lycée" they must pass, in addition, an examination in Latin, which is an optional subject in the middle school.

UPPER SECONDARY LEVEL

8. Upper secondary education aims at broadening the pupil's educational and cultural background taking, at the same time, into account his or her future occupational career. There are three main streams at this level namely the general or traditional, the technical and the vocational.

(a) General education

9. General education at the upper-secondary level comprises:

(i) The Classic Lycée with special emphasis on humanities, which prepares pupils mainly for university studies. The course lasts five years and leads to the "secondary classic diploma", which qualifies holders for admittance to all university faculties except the teaching faculties.

(ii) The Science Lycée leading by means of a five-year course to the "secondary science diploma" which qualifies holders to enter all university faculties except literature and philosophy.

(iii) The Teaching Institute (Teacher Training College) which provides training for primary school teachers. The training course lasts four years and concludes with the "teaching proficiency certificate", which qualifies holders for access to the teaching faculty, the higher physical training institute and other higher education institutions for the study of languages and literature.

(b) Technical education

10. Technical education at the upper-secondary level is given in the technical institutes which are five-year institutions leading to the "perito" (expert) diploma. There are technical institutes for industrial trades, surveying, agriculture, commerce, tourism, marine jobs and for women's occupations.

(c) Vocational training

11. Vocational training is provided by the vocational institutes, first introduced on an experimental basis in 1950. To date, there are vocational institutes for 112 specialized branches in industry, crafts, commerce, agriculture, maritime transport, hotel trades, and women's occupations. Training in agriculture lasts two years; in the other branches (with a few exceptions) it lasts three years.

(d) Education in the arts

12. A number of institutions offer training in applied arts, music, dramatic art and dancing. The most important among them are:

(i) The "arts institutes" which specializes in applied and fine arts. Training in the art institutes lasts three years, after completion of the middle school, and leads to a diploma which gives access to the "fine arts academies" for higher studies in painting, sculpture, decorative arts and stage design. Arts institutes have middle school classes with slightly diversified curricula attached to them, to take account of their specialized teaching needs.

(ii) The "arts lycées" which, by means of a four-year course prepare students to enter the "fine arts academies" or the faculty of architecture;

(iii) The "academies of music" which prepare pupils for Academy Diploma in the instrument of their choice. The length of studies varies, according to the instrument, with a maximum of seven years, after completion of the middle school;

(iv) The "national academy of dramatic art" in Rome, which trains actors and stage managers by means of a three-year course. Special examinations are required for entrance. Diploma holders have the option to attend a one-year advanced course.

(v) The "national academy of dancing" in Rome, which provides an ordinary course for ballet dancers and an advanced course for solo dancers, teaching and choreographers. Candidates have to pass an entrance examination. The ordinary course lasts eight years and trainees have to attend, at the same time a secondary school. The advanced course lasts three years.

HIGHER EDUCATION

13. Higher education is provided by universities and other university status institutions. The degree of doctor (dottore) is the first degree awarded by Italian universities. Studies in medicine last six years, in engineering and architecture five years and in other branches four years. There are also three-year courses available leading to a "diploma" in physical education or in statistics. Entrance to universities is granted to holders of an upper-secondary school leaving certificate.

TRENDS IN EDUCATION

14. In the last few years the Italian educational system has expanded rapidly. The size of the school population, particularly in middle and upper-secondary schools, has increased considerably and certain improvements have been made in working conditions. The factors which have promoted this expansion are multiple and complex; among them is the increased intervention by the public authorities in education and the growing awareness in all classes of the community of the value of education. A summary of the trends registered during the period 1951-1967 is given in Tables 1.1 to 1.4.

Table 1.1

Trends in Education: Enrolments by level and type of Education (selected years 1951/52-1966/67)

Level and type of Education	Enrolment in thousands			
	1951/52	1956/57	1962/63	1966/67
1. Primary	4,443.2	4,827.6	4,330.1	4,582.6
2. Lower secondary	795.7	929.8	1,594.1	1,819.0
3. Upper secondary	412.4	615.0	900.2	1,322.7
general(1)	239.0	301.5	353.1	551.6
technical	133.1	240.8	395.2	600.1
vocational	40.3	72.7	151.9	171.0
4. Higher	230.3	213.7	225.8	332.1
Total	5,881.6	6,586.1	7,050.2	8,056.4

(1) Classical, Sciences, Teacher training.

Sources: (a) OECD, Mediterranean Regional Project, Italy, Paris, 1965.

(b) Ministero della Pubblica Istruzione, L'Istruzione Pubblica in Italia, 1963-1968, Roma, 1968.

Table 1.2

Trends in education: Number of schools, Number of teachers and enrolment in Public and Private Schools
(1962/63, 1966/67)

Level and type of education	1962/63			1966/67		
	Number of schools	Number of teachers ('000s)	Enrolment ('000s)	Number of schools	Number of teachers	Enrolment ('000s)
1. Primary	41,390	198.5	4,330.1	41,040	207.0	4,582.6
Public	38,437	187.0	4,011.3	37,873	193.8	4,223.4
Private	2,953	11.5	318.8	3,167	13.2	359.2
2. Lower secondary	8,653	139.4	1,594.1	8,707	152.1	1,819.0
Public	7,361	126.3	1,451.3	7,630	141.6	1,709.4
Private	1,292	13.1	142.8	1,077	10.5	109.6
3. Upper secondary general (1)	1,615	30.3	353.1	1,708	38.6	551.6
Public	924	22.6	277.6	1,031	31.1	455.8
Private	691	7.7	75.5	677	7.5	95.8
4. Upper secondary technical	1,244	31.4	395.2	1,752	44.1	600.1
Public	1,069	26.8	352.0	1,370	38.2	539.9
Private	175	4.6	43.2	382	5.9	60.2
5. Upper secondary vocational	1,458	14.3	151.9	1,692	17.2	171.0
Public	1,197	11.9	128.7	1,569	16.2	163.9
Private	261	2.4	23.2	123	1.0	7.1
Total (1 to 5)	54,360	413.8	6,824.4	54,899	459.0	7,724.3
Public	48,988	374.5	6,220.9	49,473	430.8	7,092.4
Private	5,372	30.3	603.5	5,426	30.2	631.9
6. Higher	-	-	225.8	-	-	332.1

(1) Classical, Science, Teacher Training.

Source: Ministero della Pubblica Istruzione, L'Istruzione Pubblica in Italia, 1963-1968, Rome, 1968.

Table 1.3

Trends in Education: Percentage distribution of first-year enrolments by type of upper secondary education

(selected years, 1951/52-1967/68)

Type of schools	1951/52	1962/63	1966/67	1967/68
1. General	52.1	33.8	41.8	35.9
classical lycées	24.3	13.4	11.0	9.6
science lycées	7.4	7.0	11.8	13.3
teacher training	20.4	13.4	19.0	13.0
2. Technical	28.0	38.5	38.9	40.7
industrial institutes	5.7	18.1	14.6	15.0
commercial institutes(1)	13.8	12.4	15.7	15.9
agricultural institutes	1.2	0.9	0.7	0.8
Other(2)	7.3	7.1	7.9	9.0
3. Vocational	19.9	27.7	19.3	23.4
	100.0	100.0	100.0	100.0

(1) Including institutes for tourism.

(2) Nautical, surveying, home economics and other feminine trades.

Sources: (a) OECD, Reviews of National Educational Policies: Italy, 1969.

(b) See footnote, Table 1.

Table 1.4

Trends in Education: Output of the Education System

Number of Graduates ('000's)

Level and type of education	1951/52	1956/57	1961/62	1965/66
1. Primary	600.7	647.9	694.9	721.5
2. Lower secondary	174.1	223.8	393.8	475.4
3. Upper secondary	71.7	92.0	126.5	196.7
Classical	18.1	21.6	23.9	28.3
Science	6.1	6.8	8.5	13.3
Teacher-training	17.3	13.9	22.1	30.8
Technical	19.2	29.0	49.4	72.6
Vocational	11.0	20.7	22.6	51.7
Total	846.5	963.7	1,215.2	1,393.6

Source: See footnote, Table 1.

II. EDUCATIONAL AND VOCATIONAL ORIENTATION AND GUIDANCE

15. The first guidance institutions in Italy were established in 1920, the initiative at that time being with certain communal authorities and university institutes. As from 1950 guidance received consideration on a national scale and developed in two directions with agencies under the Ministry of Education and the Ministry of Labour. Guidance services are optional and free of charge.

16. The Educational Reform of 1962 (paragraph 1) provided for the integration of the "institutions at lower secondary level to a single structure, the aims of which are to promote the training of the man and the citizen and to encourage the guidance of young people in the choice of their future activities". The optional subjects introduced in the curriculum of these schools (paragraph 7) have, apart from fundamental training features, a guidance effect intended to encourage the intellectual and mental development of pupils, thus contributing to arouse their interest and discover their aptitudes, with a view to the educational and vocational choices they will have to make.

17. The reform of the upper-level secondary school structure is now under consideration, the plan being to introduce a two-year comprehensive type course followed by specialised courses of varying duration. During the comprehensive course educational choices made at the end of the compulsory schooling could be reconfirmed and those wishing, for any reason, to change their course of studies would be given the opportunity to do so.

18. The guidance function of the school is supported by the activities of the Guidance Centres which are now being established in each province in connection with the development plans for Italian schools. The Centres are responsible for interesting middle-school teachers in the problems connected with educational and vocational options. Teachers, in turn, are expected to advise in class or in private, and by their assessment at the end of compulsory schooling to give families information and advice on choices for future careers.

19. The Guidance Centres also facilitate directly the guidance task of the schools by providing parents and teachers with useful information on the different careers and on the demands of the labour market through meetings, lecturers, distribution of prospectuses and booklets, film shows, etc. Whenever necessary the Centres concern themselves directly with the individual pupils and use suitable techniques for shedding further light on personal aspects and for advising young people and their families on specific prospects and possibilities. The Centres are also expected to intervene with timely suggestions for an alteration in the pattern of studies of those who are not at ease in the sector of their initial choice.

20. The Guidance Centres are administered by a special department of the Ministry of Education set up within the School Assistance Inspectorate. The staff of the Centres consist of a psychologist director and at least one vocational guidance officer, school or work doctor and welfare worker. The directors of Guidance Centres have had courses at a university institute of psychology and the welfare workers, at a school of social work. At a few large centres there are special two to three-year courses available for guidance officers.

21. In 1968, there were 93 Guidance Centres under the Ministry of Education and the number of psychological and aptitude tests conducted by them was of the order of 180,000 (about 170,000 in groups; 10,000 individuals).

Guidance under the Ministry of Labour

22. The "vocational orientation service" of the Ministry of Labour and Social Affairs is run by the National Institute for the Prevention of Accidents (ENPI: Ente Nazionale Prevenzione Infortuni) which is a Juridical Public Establishment responsible to the above Ministry. Services are provided for apprentices, for trainees enrolled in vocational courses run by the Ministry of Labour and for handicapped persons.

23. The Law on Apprenticeship of 19th January, 1955 envisages that all workers between 15 and 20 years of age who register for the first time in a Placement Bureau must take a vocational orientation test which consists of a medico-psychological examination coupled with an inquiry into the family and/or work background. Whenever necessary this initial test is followed, after placement, by inquiries into the place of work to identify and assist in solving problems related to adaptation of the apprentice to job conditions, surroundings, etc.

24. A similar procedure is followed for workers who, before placement, enrol in special courses run by the Ministry of Labour. In such cases, the follow-up inquiries into the place of work are carried out systematically and there are meetings organised with the parents and teachers of the trainees.

25. With regard to handicapped individuals the Vocational Orientation Service covers persons in sanatoriums, orphans, blind, and deaf and dumb children. The methods applied are specially adapted to suit each individual case.

26. The ENPI Centres are attached to Placement Centres scattered throughout the country. In 1969, there were 45 such centres in operation, staffed with about 500 psychologists and welfare specialists. In 1966, the centres carried out 136,937 initial medico-psychological tests for trainees and 19,613 for apprentices; of those 7.5 per cent had a follow-up action.

Part II

TRAINING OF TECHNICIANS AND OTHER TECHNICAL MANPOWER

III. VOCATIONAL INSTITUTES

27. Vocational Institutes provide opportunity for branching off after the compulsory period and offer specialized courses in 112 areas in industry, crafts, commerce, agriculture, maritime transport, hotel trades and women's occupations. Vocational institutes enjoy administrative autonomy and are run by a Board of Management on which local interests are represented. Local authorities assist the institutes by providing school buildings and bearing the cost of maintenance and services.

28. Admission requirement for vocational institutes is completion of the unified "middle school" or passing of an entrance examination. At present, the total number of training places available exceeds the number of applicants. This is particularly true in agriculture.

29. Enrolments in the vocational institutes increased from 151,859 in 1962/63 to 171,039 in 1966/67, i.e. by 12.6 per cent. The major increase was manifested in South Italy where the Government established 60 per cent of the institutes built during the 1962-67 period. The number of vocational institutes by type of specialization is given in Table 3.1 below. The number of school units (schools and annexes) is given in Table 1.2.

Table 3.1

Number of Public Vocational Institutes by type

(1962, 1967)

Types of institutes	1962	1967
Agricultural	58	64
Industrial and handicrafts	170	198
Maritime transport	5	32
Commercial	122	162
Hotels and catering	23	31
Womens' occupations	24	30
Total	402	517

30. The training course in the vocational institutes lasts two years for agriculture and some hotel trades and three years for the other specializations. It leads to a skilled worker certificate which by most firms is considered as equivalent to the Apprenticeship Certificate. In general, large firms prefer to recruit vocational institute graduates to apprenticeship graduates because of their broader educational background but pay them as skilled workers only after a probationary year of work.

31. The curriculum for the industrial courses contains about 30 per cent of general subjects such as religion, civics, mathematics, physics and physical education, common to all branches, 41-49 per cent workshop practice 21-29 per cent related theory. Total instruction hours for each course is 4,200. Examples of programme time-tables are given in Appendix 3/I and a description of the course in electromechanics in Appendix 3/II.

32. In theory, gruaduates of the vocational institutes may, after a special test, continue their studies in the 3rd or 4th year of a technical institute. However, in actual practice very few of these graduates succeed in passing the required test as their orientation and background differs radically from that of the technical institute students. In certain branches special one-year courses are available in the vocational institutes for further specialization. Examples of such courses are given in Appendix 3/I.

33. Programmes for hotel and tourism institutes last two or three years, depending on the specialization, and contains, apart from practical work and related theory, special instructional subjects such as foreign languages, typewriting, professional hygiene, etc., as shown in the examples of the corresponding time-tables (Appendix 3/I). Most of the hotel and tourism institutes are fully residential and are located in touristic areas.

34. There is no strong formal connection between industry and the Vocational Education Authorities. However, in many cases, individual institutes work closely together with local industries which accept students for practical exposure during vacation periods. This is particularly true in the case of hotel and tourism institutes.

35. Representatives of industry stated, on several occasions, that the training programmes of the vocational institutes are not suitable for the preparation of skilled workers, which is supposed to be their main purpose. These representatives find the programmes relatively long and overloaded with theory. Many students drop out after the first year in the institutes to take up jobs in industry as apprentices or to enrol in short training courses.

IV. TECHNICAL INSTITUTES

36. Upper-level technicians or Periti are trained at the Technical Institutes which are five-year upper-secondary institutions (paragraph 10) with a dual function that is to provide the economy with middle range technical manpower and to give an opportunity to students with no particular classical or scientific bent to reach university.

Specializations available in the Technical Institutes

37. There are seven basic types of Technical Institutes as follows: Industrial Institutes, Commercial and Business Administration Institutes, Agricultural Institutes, Nautical Institutes, Tourism Institutes, Institutes for surveyors and Women's Technical Institutes, specializing in forty-two branches of the economy. In 1967/69 there were over 600 thousand students in Technical Institutes distributed as shown in Table 4.1.

38. Technical Industrial Institutes offer courses in: mechanical industries; electrical industries; chemical industries and physics; textiles; agricultural industries and mining; building; paper industries; graphic arts; optical instruments; photographic arts and plastics. In 1967 there were 168 state and 56 private industrial institutes with 548 specialized departments as shown in Table 4.2. Further details, that is, a list of the State Industrial Institutes and of the specializations available in each of them is given in Appendix 4/I.

39. The Nautical Institutes offer three kinds of specialized courses namely for master mariners, machinists, and shipbuilding technicians. Specializations offered by other types of Technical Institutes are given under the appropriate headings in the text.

40. Admission to the Technical Institutes is granted to graduates of the Middle School. Since the November 1961 reform courses at the Technical Institutes last five years and comprise a two-year cycle common to all types and branches of Technical Institutes followed by a three-year specialized cycle.

Table 4.1

Number of Public and Private Technical Institutes and Enrolments by Field of Specialization
(1966/67)

Field of Specialization	Number of Institutes			Enrolment		
	Public	Private	Total	Public	Private	Total
1. Industrial	316	56	372	219,627	19,269	238,896
2. Commercial	667	214	585	269,856	32,448	213,538
3. Surveying			296			88,766
4. Business administration	229	49	278	17,883	2,545	20,428
5. Tourism	6	6	12	1,264	348	1,612
6. Nautical	37	2	39	9,711	151	9,862
7. Feminine occupation	52	48	100	9,283	4,014	13,297
8. Agricultural	63	7	70	12,306	1,402	13,708
Total	1,370	382	1,752	539,930	60,177	600,107

TABLE 4.2

INDUSTRIAL INSTITUTES: SPECIALIZATIONS AND DEPARTMENTS(1)
(1967/68)

Specialization	Number of Departments		
	State	Private	Total
1 Mechanical Industries	**183**	**15**	**197**
General mechanics	127	10	126
Metal mechanics	31	4	35
Precision mechanics	3	-	3
Aircraft construction	7	-	7
Marine mechanics	1	-	1
Heating techniques	8	1	9
Metallurgy	5	-	5
Watchmaking	1	-	1
2. Electrical Industries	**178**	**30**	**208**
Electronics	121	11	132
Industrial electronics	25	11	36
Telecommunications	32	8	40
3. Chemical Industries and Physics	**79**	**5**	**84**
Industrial chemistry	63	5	68
Nuclear chemistry	1	-	1
Industrial physics	8	-	8
Nuclear energy	7	-	7
4. Textile Industries	**23**	**0**	**23**
Textiles	12	-	12
Dyeing	8	-	8
Fabric designing	2	-	2
5. Agricultural Industries and Mining	**8**	**0**	**8**
Cereal industry	1	-	1
Food industries	2	-	2
Tanning	1	-	1
Mining	4	-	4
6. Other Industries	**21**	**6**	**27**
Building	14	4	18
Paper industry	1	-	1
Graphic arts	1	2	3
Optical instruments	1	-	1
Photographic arts	1	-	1
Plastics	3	-	3
Grand Total	492	56	548

(1) Including departments in Annexes.

41. The two-year cycle is intended to:

(i) give the pupils a cultural backbround through the study of their native tongue and literature, history and civics and to initiate them into technology through mathematics and natural sciences;

(ii) prepare the pupils for experimental laboratory work and for the study of technology by instructing them in the basic manufacturing processes;

(iii) teach art as a medium of expression and communication;

(iv) teach one or more foreign languages; and

(v) instruct and guide young people to discover their inclinations and abilities and choose their future career accordingly.

42. The programme time-table for the two-year basic course is given in Table 4.3. In the revised syllabus there has been a reduction in the number of hours devoted to practical work (it now totals to approximately 11 per cent of the instruction time), more attention being given to sciences and to teaching of technological processes and manufacturing methods.

43. Although the teaching of general subjects in the two-year basic cycle has effectively been standardized, the guidance idea has not yet made sufficient impact, the result being premature introduction of vocational subjects at the expense of the science/general technology part of the curriculum. Therefore, there are still substantial differences in this part of the programme of the various types of institutes, which limits the pupils' possibilities of choice of the specialized cycle.

44. In theory, pupils completing successfully the two-year basic course are eligible to enter, without examinations, the specialized three-year cycle of their choice.

45. The programme of the specialized cycle contains general subjects, mathematics, science and technical disciplines and workshop practice, in the proportions shown in Table 4.4. Further details on the programmes and the curriculum of the Industrial Institutes are given in Appendices 4/II and 4/III.

46. Upon completion of the three-year specialized course, successful students are awarded the title of "Perito" (Expert) which corresponds to a high level technician diploma and, in the case of Industrial Institutes, qualifies the holder for admittance to the Faculties of Mathematics, Physics and Natural Science, Economics and Commerce, Engineering, Statistics, Demographic and Actuarial Science, as well as to the Naval University Institute and the Institute of Oriental Studies in Naples, and the University Institute in Venice.

Table 4.3

Technical Institutes: Two-year basic course
(common to all branches)

Subjects	Instruction periods per week		total(1)
	1st year	2nd year	
1. General	16	13	29
Scripture	1	1	2
Italian	5	5	10
History and civics	2	2	4
Geography	3	-	3
Foreign language	3	3	6
Physical training	2	2	4
2. Mathematics and science	10	17	27
Mathematics	5	4	9
Natural science	-	3	3
Physics(2)	5	5	10
Chemistry(2)	-	5	5
3. Technical	10	8	18
Drawing	6	4	10
Workshop practice	4	4	8
	36	38	74

(1) In units: one unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

Table 4.4

Industrial Institutes: General programme time-table for the three-year specialized cycle

Subjects	Instruction periods per week			total(1)	as a percentage of total
	3rd year	4th year	5th year		
1. General	10	8	10	28	24.6
Scripture	1	1	1	3	
Italian (language and literature)	3	3	3	9	
Foreign language	2	-	-	2	
History and civics	2	2	2	6	
Law and economics	-	-	2	2	
Physical training	2	2	2	6	
2. Mathematics	3-4	2-4	0	5-8	4.4-7.0
3. Science and technology(2)	16-21	18-24	30-36	64-81	56.2-71.0
4. Workshop practice	4-8	4-8	5-8	13-24(3)	11.4-21.0
Total	38	38	38	114	100.0

(1) In units = one unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

(3) In some courses (industrial chemistry, nuclear chemistry, food industries, chemical dyeing, fabric designing) workshop practice is partially or totally replaced by laboratory work.

47. Final examinations are conducted by a Board of Examiners appointed each year by the Minister of Education in consultation with the appropriate inspectors. The Board is composed of a university professor or the principal of a Technical Institute who acts as chairman, a teacher representative of the Technical Institute for which the examinations are organised, teachers from other Technical Institutes and a representative of the appropriate professional body.

Training of "Superperito"

48. Post-graduate courses leading to a higher technician or "superperito" diploma, that is a qualification between the "perito" and the "engineer" have been introduced a few years ago by the IRI(1) (see paragraph 76) and the private industry. The Ministry of Education adopted this idea and started similar courses, on an experimental basis, in certain public Technical Institutes. However, the qualification of "superperito" has not been officially recognized as yet.

49. The higher technician courses last two or three years, when full-time, and contain about 50 per cent of theory and 50 per cent of practice in the appropriate discipline. In 1969, there were seven Technical Institutes offering post-graduate courses as follows:

Location	Specializations offered
1. Rome (E. Fermi)	Applied Electronics
2. Milano	Mechanical Technology
3. Milano	Chemical Technology
4. Naples	Mechanical Technology
5. Terni	Metallurgical and Iron Technology
6. Genoa	Mechanical Technology
7. Udine	Mechanical Technology, Building Technology.

Further information on higher technician courses are given in paragraphs 87-92 and 104.

V. TECHNICAL UNIVERSITIES

50. The Italian University system is governed by the Higher Education Code which became Royal Decree in August 1933 and several subsequent amendments and regulations. The system is based on the principle of autonomy with respect to administration, teaching and discipline, within the limits determined by law. Each University has its own statute establishing the study

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(1) The Istituto Ricostruzione Industriale, grouping a number of nationalized industries.

syllabus for each degree course and the order of registration and examinations for the various subjects and the institution of optional subjects among which the student chooses a fixed number he intends to study.

51. In the Universities and the other Higher Education Institutes the te aching is grouped into: (i) Faculties; (ii) Post-graduate schools and courses which are attached to the different Faculties and either teach subjects proper to the Faculties themselves or co-ordinate special groups of subjects belonging to other Faculties; (iii) Special schools which may depend on certain Faculties or function independently. Examples of such schools are: The Special School for Archivists and Librarians (Rome University), the Special Trade Unionist Training School (in Padua) etc.

52. There are Engineering Faculties in the Universities of Bari, Bologna, Cagliari, Genoa, L'Aquila, Naples, Padua, Palermo, Pisa, Rome, Trieste and the Polytechnics of Milan and Turin. Studies can be persued in one of the following branches of engineering: Civil, Mechanical, Electrical, Chemical, Marine, Aeronautical, Mining, Electronic and Nuclear Energy.

53. Enrolments in the Faculty of Engineering increased from 20,491 in 1962/63 to 30,705 in 1967. The per cent distribution of enrolments by Faculties for the years 1962/63 and 1966/67 is given in Table 5.1 below.

54. Access to the Faculty of Engineering is granted to holders of a secondary "classic" or "science" diploma (paragraph 9) and, under certain conditions to graduates of Technical Industrial Institutes (paragraph 46). The minimum age for entry is 17 years, but it is normal for students to enter between the ages of 18 and 20.

55. The course in Engineering lasts five years and is subdivided into a two-year preliminary course, common to all branches of engineering, and a three-year specialized course. The total number of teaching hours vary between the different years of the course and the different branches of engineering, averaging about 1,000 hours per year. Practical training in industry is not so far an essential part of engineering education. In certain cases, however, employers require some practical training after completion of studies, corresponding somehow to a post-graduate apprenticeship.

56. Qualifying examinations are written, oral or practical depending on the subject and lead to the "Laurea in Ingegneria" and the title of "Dottore in Ingegneria" (Doctor in Engineering) which, however, is not sufficient for practicing engineering. Holders of this title who wish to register as practicing engineers must pass a special state examination (Esame di Stato per la Abilitazione) and fulfil certain other requirements specified by law.

Table 5.1

Per cent distribution of enrolments in higher education by Faculties
(1962/63, 1966/67)

Faculty	1962/63	1966/67
1. Engineering	8.1	9.7
2. Architecture	2.0	2.0
3. Agriculture and Veterinary Science	1.0	1.6
4. Commerce and Economics	32.2	26.9
5. Natural Sciences a and Mathematics	11.1	16.9
6. Medicine	6.1	7.7
7. Pharmacy	1.3	0.9
8. Law and Political Sciences	12.2	9.2
9. Literature and Philosophy	8.9	9.7
10. Education	13.3	12.4
11. Other	3.8	3.0
Total	100.0	100.0

57. Post-graduate studies in engineering in Italy can be divided into three categories as follows: (i) formal education involving full-time attendance at a university for one or two years; (ii) formal education involving full-time or part-time attendance at a scientific or government institution; (iii) research work done at a university institute under the direction of a member of the academic staff. Legally only those who complete successfully a two-year post-graduate course are awarded the title of "specialist".

VI. TECHNICAL AND VOCATIONAL TEACHER TRAINING

58. Teachers of general subjects and technology in technical and vocational schools are recruited from among university graduates who have passed a special examination (esame di abilitazione all'insegnamento) after their first level university degree. Trade theory and workshop instructors are normally skilled workers or technicians trained at a vocational or technical institute. They are not required to hold any additional certificate or qualification authorizing them to teach. However, for each technical or vocational subject taught there is a university-trained teacher responsible who gives classroom instruction only. Instructors for the training centres of the Ministry of Labour are trained in Vocational Teacher Training Centres run by the same Ministry.

59. A marked change has occurred during the last few years in the status and salaries of the workshop instructors. Formerly considered merely as workers, they are now recognized as teachers and their legal and administrative status is close to that of a middle school teacher.

60. In 1953 the Ministry of Education set up the National Pedagogical Centre for Vocational and Technical Training as a first step towards raising the teaching standards in technical and vocational schools. Recently a new type of teacher training has been initiated with the establishment of an Agricultural Vocational Teacher Training College in Latina.

The National Pedagogical Centre for Vocational and Technical Training

61. The courses run by the National Pedagogical Centre of the Ministry of Education are technical refresher or pedagogical courses and are intended for already working technical teachers and instructors. They group together teachers of the same subject or trade and aim at improving the teacher's technical competence by initiating them in modern teaching methods and giving them supervised teaching practice and instruction in the principles of teaching and psychology.

62. The methods used include classroom lectures followed by discussion, laboratory work to accustom students to handling demonstration equipment and measuring instruments and conducting experiments before a class, group activities and seminars, and trial lessons in which new methods are used experimentally and which are followed by criticisms and discussion. At the end of the course the trainees are rated on their performance.

63. Duration of normal courses is two months but longer courses (up to 10 months) have been organised for teachers of technology and draughting and workshop instructors for metal trades. The centre also runs, from time to time, one to four-week up-dating courses in specific trades such as electricity, metal trades, general mechanics, mechanical drawing, agricultural machinery, horticulture and fruit growing. These courses are organised, as needed, for a particular group of teachers (vocational school principals, teachers of science and technology, etc.), for the whole teaching staff of a given vocational school or institute, or for a given region. Some of the courses are residential.

64. The centre also provides for further training through a system of fellowships permitting vocational and technical school teachers to attend technical courses or training programmes at universities, research institutes, or private undertakings. Research is also included in the terms of reference of the centre which is expected to investigate methods and means for improving the instruction given in vocational schools and institutes, to organise or co-operate in research projects concerning the psychology of adolescents, and to maintain contact with scientific and research associations and employers and workers' organisations so as to co-ordinate technical education activities with the needs of the economy.

Vocational Teacher Training Centres, CNFI (Centri Nazionali Formazione Istruttori)

65. In 1953/54 two vocational teacher training centres were set up under the sponsorship of the Ministry of Labour, one in Genoa, organised as a special unit attached to a joint industrial apprenticeship training centre for basic metal trades, and one in Naples, as a single unit for training both instructors and skilled workers for building trades. Today the centre in Genoa is run by IRI (Istituto per la Ricostruzione Industriale, see paragraph 76) and that in Naples by INAPLI (Istituto Nazionale per l'Addestramento e il Perfezionamento dei Lavoratori dell'Industria, see paragraph 73. Instructor training courses were also introduced in the IRI centres of Naples (1966), Taranto (1966) and Terni (1968). The number of instructors trained in the IRI Centres during the period 1965-69 is given in Table 6.1 below. CNFI run both basic training courses and refresher courses.

Table 6.1

Number of instructors trained in IRI Training Centres
(1965-69)

Centre	1965/66	1966/67	1967/68	1968/69	Total
Genoa	261	294	479	637	1,671
Naples	-	62	103	164	329
Taranto	-	43	75	128	246
Terni	-	-	-	80	80
Total	261	399	657	1,009	2,326

65. Basic courses at the CNFI are open to persons aged between 25 and 40 and are held in the following trades: fitting, machine shop, welding, electromechanics, Industrial electronics, general mechanics. The length of the basic training course is 19 weeks, that is a total of 836 instruction hours, and that of the refresher courses one month or 180 instruction hours.

66. Selection for the courses is carried out by the CNFI Admission Division. To be eligible, applicants for the basic course must have worked in industry for at least five years as skilled workers in the trade for which they wish to specialize as instructors; possess the leaving certificate of the middle school or equivalent qualification; be between 25 and 40 years of age; pass a complete medical check-up; and succeed in a special entrance examination comprising a test in engineering drawing, technology, Italian language, workshop practice and an aptitude test. Trainees for the refresher courses are selected from among trained instructors.

67. The training programme for the basic course contains the subjects given in the time-table below.

68. Final examinations for the basic courses take place in the presence of a special Commission composed of representatives of the Ministry of Labour, the Ministry of Education, the INAPLI, the CNFI, the Trade Unions and the Association of Manufacturers. The trainees undergo a written technical teaching test which includes the preparation of a practical exercise for training. This test is discussed step by step in the presence of the Commission. Successful candidates receive a Certificate of Qualification to operate as Instructors in the trade for which they have been trained.

Table 6.2

Time-table for Instructor training courses

Subjects	Instruction hours	Subjects	Instruction hours
1. Teaching methods and practice	567	5. Engineering drawing	72
2. General Technology (mechanical)	36	6. Sanitary and Safety regulations	18
3. Mathematics	36	7. Human relations	18
4. General and civic culture	36	8. Discussion	9
		Total	792(1)

(1) Plus one week (44 hours) for final examinations.

69. Refresher courses are based upon 36 subjects that are mainly concerned with the following points: structure and organisation of CNFI; origin of vocational training in Italy; techniques of teaching and job training; teaching of theoretical subjects; preparation of practical exercises and teaching of related theory; techniques for the study and planning of a job-training programme or for the improvement of an existing programme; evaluation methods; techniques for writing up of students' information evaluation; techniques for preparation of final examination tests; methods for general orientation and education of students in order to prepare them for factory life; information concerning the various tasks of the instructor in the field of education and training. For these courses the hours of teaching are not distributed in a specific manner.

70. Trainees completing a refresher course undergo a test, in the presence of a Commission composed of CNFI officers, which includes:

(i) preparation of an "Instruction Sheet" covering the workshop operations of a practical exercise;

(ii) written test on a number of questions concerning the subjects studied during the course;

(iii) oral examinations to cover gaps or weak points in the above tests.

71. The CNFI provide a follow-up service for the instructors who have gone through the Training Centres. During the training these instructors have been initiated into a special system of training comprising graduated lessons and exercises which can be adapted or grouped to meet the needs of different categories and levels of trainees. The student teachers take away with them a set of technical/pedagogical documentation concerned with the trade they are going to teach. The centres remain in touch with them, keep them up-to-date on new developments and advise them on adaptations which should be made in the training programme.

VII. TRAINING OUTSIDE THE EDUCATIONAL SYSTEM

72. Numerous are the training activities outside the educational system initiated by both governmental and private agencies. The most important among these activities are briefly described in this chapter.

ACTIVITIES OF THE MINISTRY OF LABOUR

73. The Ministry of Labour is in charge of the Apprenticeship Training and runs several Training Centres most of them attached to private industries or directed by semi-governmental organisations such as the IRI (see paragraph 76). A special institution, the INAPLI (Istituto Nazionale per l'Addestramento e il Perfezionamento dei Lavoratori dell'Industria - National Institute for the training and up-grading of industrial workers) is in charge of all the training activities under the Ministry of Labour. In 1968/69 a total of 16,230 courses were run for 395,564 trainees in over 200 different trades. The Vocational Teacher Training Centres (see paragraph 65) were also established under the sponsorship of the Ministry of Labour.

74. Apprenticeship training is open to those who pass an aptitude test run by the Vocational Orientation Service of the Ministry (see paragraph 22) and are at least 15 years of age (14 if they are graduates of a middle school). Training lasts two or three years, depending on the trade, and leads to a skilled worker certificate. Apprentices work in industry and attend classes for an average of four hours a week.

75. Full-time training in the centres lasts two years and comprises two-thirds of workshop practice and one-third of related theory. Further details on this type of vocational training are given below under IRI's and private industry's activities.

IRI AND ITS TRAINING ACTIVITIES

76. IRI (Istituto per la Ricostruzione Industriale - Institute for Industrial Reconstruction) was set up by Decree Law in 1933 with the main purpose to save the banks which, at that time, were in danger because of a serious economic crisis and to put the finances of Italy's industry in order. This important task was achieved in a period of four years. At the same time, it was realized that IRI had vast possibilities of development as an instrument for putting through a national economic policy and it was therefore transformed into a permanent institution.

77. IRI is part of a system at the apex of which stands the Ministry of State Participation. It controls 130 firms, each of which is a share company and is organised and run as any Italian private company. The institute stands at the head of a pyramid which spreads down through five sectorial holding companies (shipbuilding, steel, engineering, shipping, telephones). Some companies, such as Alitalia, the National Radio and Television network, etc., as well as some important banks depend directly on IRI.

78. The training activities of IRI are entrusted to IFAP (IRI Formazione Addestramento Professionale - IRI Vocational Education and Training) a joint-stock company within the IRI group, and cover training of workers, foremen, technicians and managers). IFAP has established training centres in Genoa, Milano, Trieste, Terni, Naples and Taranto which trained over 12,000 persons in 1968/69. The activities of the IRI centres for the period 1965/66-1968/69 are summarized in Table 7.1 below. Moreover, the IRI Centres are intended to develop

Table 7.1

Training activities of the IRI Centres

(1965/66-1968/69)

Type of courses	Number of persons trained			
	1965/66	1966/67	1967/68	1968/69
1. For young workers	2,053	2,107	2,008	1,858
2. For adults	2,646	3,854	5,659	8,097
3. For technicians	417	893	1,265	1,102
4. For instructors	261	399	752	1,109
Total	5,377	7,253	9,684	12,166

activities of technical assistance to the factories and are, therefore, equipped with the necessary means to study specific programmes for courses and to supply or train the necessary instructors. IRI has also set up a Management Development Centre in Rome to conduct training and refresher courses through lectures, seminars and discussion groups. The most important among the training activities of IRI are described in detail below.

(a) Courses for young workers

79. The purpose of these courses is to supply young workers aged between 15 and 16 years with a complete job-training, thus enabling them to occupy production jobs in the following groups of trades; mechanics, electromechanics, electronics, machine operating, sheet metal, welding and foundry.

80. Admission to these courses is regulated by a special procedure which includes a medical check-up, aptitude test and a cultural test. The length of training is two years or an average of 3,520 instruction hours and includes six months of orientation training (1,050 hours) 10 months of multi-purpose training (1,800 hours) and 4 months of specialized qualification training (700 hours). The multi-purpose training is intended to enable the trainee to address himself towards the most requested trades even in the last six months of his course and guarantees the advantageous placement in a wider range of trades within the industry. Details of the training programme are given in Table 7.2 below.

Table 7.2

IFAP Courses for young workers - general programme time-table

Subject	Instruction hours
1. Drawing	280
2. Mechanical Technology	140/280(1)
3. Physics and Electricity	60/265
4. Electronics	50/275
5. Mathematics	175
6. General and Civic Culture	210
7. Metrology	40/65
8. Workshop Organisation and Safety Regulations	36
9. Physical training	70
10. Religion	35
11. Workshop Practice	2,290

(1) Depending on the trade.

81. Final examinations include tests in drawing, mathematics, general and professional culture (oral) and workshop practice and lead to a "Certificate of Training". They take place in the presence of a special Examinations Commission composed of, one of each, representatives of the Ministry of Labour, the Ministry of Education, INAPLI (see paragraph 73), the Trade Unions, the Association of Manufacturers and the Centre. Graduates are placed within local industries and about 50 per cent of them in IRI firms.

(b) Training courses for adult workers

82. The purpose of these courses is:

(i) to supply adults aged between 18 and 35, who are generally unemployed unskilled workers, with intensive job-training to enable them to occupy production jobs in fitting, machine shop, turning, milling, grinding, welding, electromechanics, electronics. These courses last from a minimum of 21 weeks or 900 hours (mechanical courses) to a maximum of 42 weeks or 1,800 hours (electronics) and include about 65 per cent of practice and 35 per cent of related theory and general culture;

(ii) to supply adults as above, who generally are unemployed and unskilled seamen, with intensive job-training to enable them to take up jobs as motorists, mechanics, electricians, refrigerator mechanics, oilers, stokers. These courses last 23 weeks (1,000 hours) and include about 60 per cent of practice and 40 per cent of related theory and general culture;

(iii) to supply adults already employed with retraining or accelerated specialized training in mechanics, electromechanics, electronics, metalworking and shipbuilding, according to the needs of the sponsoring firm. These courses last from a minimum of 44 to a maximum of 600 hours depending on the trade and the type of training.

83. Qualifying examinations include tests in drawing, general and professional culture (oral), workshop practice and a job proficiency test and take place in front of a special examinations commission of the composition described in paragraph 80. Successful candidates receive a "Certificate of Training" or, in the case of refresher courses, a "Certificate of Attendance".

(c) Courses for safety techniques

84. To develop and strengthen sensibility and knowledge of safety problems and regulations IRI sponsor courses reserved for technicians responsible for handling of safety problems and for employees who are concerned with such problems because of the job they have to deal with. These courses last six weeks (two 3 week sessions) or an average of 240 instruction hours and include general and technical aspects of accident precaution and organisation of safety services.

85. Participants to the above courses are sent by the firms. In general they are between 25 and 45 years of age and have an average of ten years experience in their job. Most of them are in possession of a "Perito Industriale" diploma.

(d) Instructor Training Courses

86. Instructor training and refresher courses run by the IRI centres are described in detail in Chapter 6 of this report (paragraphs 8-15).

(e) Courses for Higher Technicians

87. A research conducted by IRI and FINMECCANICA (A Manufacturers' Association) in a group of mechanical firms brought to light that university engineers are often employed in positions inferior to their education, while, on the other hand, the "periti industriali" are often requested to occupy higher positions than their capabilities. To fill the gap between technicians and engineers IRI launched two types of courses for training "higher technicians" as follows:

(i) Courses TS1 which are intended for graduates of Industrial Technical Institutes with no previous work experience; and

(ii) TS2 or advanced courses which are intended for employed technicians having both professional experience and intellectual qualities.

88. Eligible for the TS1 courses are: graduates of the Industrial Technical Institutes who are not over 25 years of age and have an average mark in the diploma not less than 6.3 (out of 10). Every trainee receives a monthly salary directly from the firm where he is to work at the end of the course. Selection procedure includes collective aptitude and character tests, individual interviews and an accurate medical check-up. The final decision is left to the recruiting firms.

89. TS1 courses last two years (2,400 hours) and comprise periods in the Centre and periods of practical stages in Italy and abroad. The programme includes 25 per cent of general cultural subjects, 41 per cent mathematics, science and technology, and 34 per cent production techniques. In the first year the basic subjects are taught such as mathematics, mechanics, technology, electricity, drawing, and time and motion study and are common to all sectors. In the second year the specialized subjects and production techniques are distributed among the various sectors according to the specific needs of the recruiting firms. Trainees are under continuous evaluation by the personnel of the Centre and are periodically rated by the teachers. Rating reports also contain remarks on the character and behaviour of trainees and are intended to give the recruiting firm the necessary information concerning the trainee.

90. TS2 courses aim at creating high level technicians capable of handling the factory work section or of organising and being in charge of development and production, time and motion studies, material handling, workshop organisation, production, planning, tool designing, maintenance, and production control.

91. Candidates for TS2 courses should possess the following pre-requisites:

(i) be between 25 and 40 years of age;

(ii) employed in production or workshop departments;

(iii) possess over five years of work experience;

(iv) have middle-management responsibilities;

(v) have a level of education equivalent to that of a "perito industriale" or at least sufficient to pass the selection process which includes several tests, personal interview and group discussions.

92. Advanced courses last two years and are divided into two periods of 16 and 8 months respectively. During the first period participants alternate work with study and attend basic subjects (mathematics, physics, technology, English Language) for a total of 320 hours. The second period includes 1,280 instruction hours in production techniques and other specialized subjects according to the specific needs of the recruiting firms. Participants are under continuous evaluation by the teaching staff and a "good" rating at the end of the first period is a pre-requisite for the second period.

(f) IFAP Management Development Centre

93. The IFAP Management Centre in Rome is a major teaching institution offering a variety of post-experience programmes with a large full-time staff of well qualified lecturers. There are some 10,000 managers within IRI who form the clientele for the programmes prepared by this Centre.

94. The training programmes include 6 to 14 week courses and seminars for managers and high administrative officials and cover managerial functions, systems analysis, research operations, personnel management and administration, marketing, public relations, supervision.

95. In 1968 IFAP organised for the first time four month full-time programmes for post-graduate students, as an introduction to the business world. Each programme consists of a general part (10 weeks) common to all programmes and a specialized six-week course in one of the following areas: marketing, business organisation and systems, personnel, finance and controls, production.

TRAINING IN PRIVATE INDUSTRY

96. Many private industries and industrial Associations have developed important training schemes to cope with their own demands in technical manpower. Trade Unions and certain Professional Associations are also actively engaged in training. Some representative examples are given below.

(a) The FIAT training school

97. FIAT is a vast enterprise with over 140,000 employees established in 1899. The FIAT School in Torino (Scuola Centrale Allievi FIAT) started in 1921 with the purpose to train and to up-grade skilled workers, technicians and engineers necessary for the enterprise.

98. Skilled worker courses last three years after the middle school or one year after the vocational institute and include 70 per cent of workshop practice and 30 per cent of related theory and general culture (including Physical Education). Trainees are selected by means of a test in mathematics, an aptitude test and a medical examination and specialize as mechanics, electricians, motorists or modelists. The number accepted each year is around 500. During the course trainees receive a small amount of pocket money 15,000-30,000 lire/month, depending on their progress. Instructors are selected from among the best graduates of the school.

99. The school also offers 6-month practical orientation courses to about 60 technicians (periti) and 30 engineers every year and arranges special study terms with the appropriate faculties.

(b) Training by the Industrial Association "Lombarda" (Assolombarda)

100. The Industrial Association Lombarda is a large industrial organisation with its headquarters in Milano. The Association participates in seminars and research projects on technical and vocational education and is actively engaged in the training process by running its own training centres (Centro Lombardo) and by organising courses and study programmes in collaboration with Vocational and Technical Schools and Institutes.

101. At the semi-skilled and skilled worker level the Association offers courses in the mechanical and electrical trades specially designed for youngsters from the south or other less developed regions. Most of the trainees have substantive scholarships for the period of their training.

102. The basic semi-skilled worker courses last 12 months, the first three of which are devoted to basic technical knowledge and workshop practice and the rest to specialisation. Time distribution between theory and practice is as follows:

	Mechanical trades	Electrical trades
Workshop practice:	56%	60%
Related theory and general culture:	44%	40%

The best among the graduates of the basic courses are selected for an advanced six month course leading to a skilled worker certificate. About 500 trainees go through such courses each year.

103. Assolombarda also runs training and refresher courses for managerial and clerical staff in several fields such as: personnel administration, industrial statistics, foreign trade, production control, production planning and programming, industrial economics, automation, marketing techniques, foreign languages, etc. It is estimated that 5,000 trainees/year attend such courses.

104. Another major training activity of the Assolombarda is the organisation and sponsorship of the higher technician (superperito) course at the Higher Institute of Industrial Technology, Milano which is a section of the State Industrial Institute G. Feltrinelli. Similar courses for higher technicians are run by other industrial Institutes (see paragraph 48) and the IRI (see paragraph 87).

105. The Association collaborated in devising the training programme for the Institute and in providing some of the highly specialized teachers. The programme is open to graduates of the Technical Institutes in the branches of Mechanical or Electrical technology and lasts three years, each of which is divided in three periods as follows:

(i) eight months in the institute;

(ii) two months abroad (Great Britain, etc.) for work in industry;

(iii) two months work in a local industry.

106. During the first year of training emphasis is given on general technological subjects and the objective is to align the background knowledge of mechanical and electrical technicians. The second year is mainly devoted to advanced technological training and the third to further technological training and socio-economics. The individual subjects taught each year are given in Table 7.3 overleaf. The enrolment in the higher technician courses is around 80.

(c) Trade Unions and Training

107. Two of the most important Trade Unions in Italy, CGIL (Confederazione Generale Italiana del Lavoro) and CISL (Confederazione Italiana Sindacati Lavoratori) have developed numerous training programmes for semi-skilled and skilled workers.

108. CGIL dispenses its programmes through the ECAP (Ente Confederale Addestramento Professionale - Confederate Union of Vocational Training) which disposes about 300 training centres throughout the country and runs semi-skilled and skilled worker training courses for youngsters and adults in several trades such as electromechanics, radio assembly and repairs, fitting, etc. Skilled worker courses last two to three years at the rate of four hours/day, five days/week. At the end of each year a special certificate is awarded stating the degree of specialization achieved. It is estimated that about 15,000 trainees (including apprentices) attend the ECAP courses every year. The running expenses of the courses are borne by the Ministry of Labour.

Table 7.3

TRAINING PROGRAMME FOR HIGHER TECHNICIANS

(Higher Institute of Industrial Technology, Milano)

Subjects taught

First Year

Mathematics
Mechanics
Industrial drawing
Metallurgy
Time calculations
English
Electro-technology, Electrical measurements) for mechanical technicians
Mechanical technology - for electrical technicians

Second year

Electronics
Foundry
Welding
Heat treatment
Physical techniques
Apparatus, machines and equipment
Metrology
Chemistry
Statistics
Human factors
English

Third year

Machine tools
Equipment and automation machines
Sheet metal work
Machine construction
English
Work psychology
Social economics
Industrial drawing
Quality control
Industrial economics
Conferences and seminars

109. Similar to the above are the training activities of the CGIL which are dispensed by the IAL (Istituto Addestramento Lavoratori - Worker Training Institute) in Rome. Both Trade Unions participate in seminars and conferences on training problems organised by the Ministry of Labour or by Industrial and Commercial Associations.

Part three

FUNCTIONS OF TECHNICIANS

VIII. TECHNICIANS AND THEIR OCCUPATIONS

110. The majority of technicians in Italy work in industrial enterprises and, in particular, in the following departments· developing and testing, planning, calculations, design, production and operation, assembling, maintenance and servicing, technical administration and management sales. A number of them occupy posts in education or in the public services.

111. Technicians (periti) are mainly trained in the Technical Institutes. However, a research conducted by IRI (paragraph 87) brought to light that there is a considerable gap between University Engineers and Periti with the result that engineers are often employed in positions inferior to their education, while on the other hand, Periti are often requested to occupy higher positions than their capabilities. This led to the establishment, in the early sixties, of courses for higher technicians or "Superperiti" to supplement the training of technical institute graduates. Such training is also given by several individual firms (paragraps 87, 89 and 104).

112. There is no available data concerning the actual number of engineers and technicians at work nor a breakdown by sector of activity or specialization. In the school year 1961/62 there were 1.5 industrial technicians trained for each engineer. By 1966/67 this ration rose to 1.9 technicians per engineer. According to the MRP report much greater demand for trained technicians will be anticipated in the years to come.

113. An analysis of the Italian labour force in large enterprises shows that, as in other industrialised countries, the functions and position of technicians depend on a variety of factors such as the proportion of technicians in the total staff, the proportion of technicians to professional engineers employed, the size of the firm, and the nature of the job and/or products.

114. In general the following observations have more or less universal application:

(i) the smaller the proportion of technicians to skilled craftsmen, the more important their role and function in the production process becomes;

(ii) in firms where proportion of technicians in the total labour force is much larger than that of professional engineers, technicians have much wider scope to utilize their skills and knowledge;

(iii) technicians employed in small firms work more independently e.g. in determining time limits for the job, incorporating their own ideas and methods of work, questioning the professional engineers' plans etc.;

(iv) firms heavily engaged in research have a higher proportion of engineers than technicians who, in such cases, are rather viewed as assistants to the former. On the other hand, in firms engaged in routine production technicians often carry out engineering functions with only periodic supervision from professional engineers.

115. In general, whereas in the professional world the industrial technician is highly appreciated and advantageously employed, in the wider world of society he is much less valued and appreciated and he is, oftentimes, considered as nothing more than a "failed engineer".

116. Industrial technicians are organised under the professional association "Consiglio Nazionale dei Periti Industriali" which covers only self-employed technicians and deals mainly with professional problems such as social insurance, restrictions imposed by law on exercising professions at the technician's level etc. Data furnished by this Association indicate that earnings of industrial technicians are, in general, 20 per cent lower than those of engineers in the respective fields.

IX. AN INDUSTRIAL SURVEY

117. A sample survey on the functions of technicians in industry was sponsored by the O E.C.D. in 1963/64 and covered the machine tool industry (three firms) and the supply and distribution of electricity (one firm). A number of "formal" interviews were held with technicians in several different fields and discussions were carried out with managers and supervisors at several levels. The main findings of this survey are summarized in the tables of Appendix 9/I. Further details, supplemented with remarks and observations made at the time of the visit, are given below.

118. During the survey difficulties were encountered in deciding who were technicians and how they differed from skilled craftsmen. In general, the definition used by each individual was adopted although, in many cases, this definition was based on functional structure rather than on formal qualifications. In fact the majority of the technicians interviewed had not completed a Technical Institute. Instances were also found where university engineers were carrying out technicians' assignments.

119. Similar posts, even within the same establishment, were found to be occupied by technicians with varied educational background and job experience.

Technicians in the machine tool industry

120. The machine tool firms investigated were chosen from among those in the north and central part of the country (Milan, Padua, Bologne) as the south, being only in its initial stages of industrialisation, presents a rapidly changing image.

121. During the inquiry sixteen technicians holding posts in several different departments of the firms visited were interviewed. In general, technical staff in each firm were found to be assigned with jobs which can be classified in six groups as follows:

(i) elementary routine jobs not demanding any special training or knowledge (e.g. copying drawings);

(ii) simple but non-routine jobs which are carried out according to instructions and demand specific knowledge or training (e.g. draftsmen);

(iii) independent jobs which must be executed according to specific instructions and demand the observation of certain general rules as well as special training and experience (e.g. execution according to drawings);

(iv) independent jobs demanding special knowledge and experience as well as ability in directing and supervising small groups of technical staff;

(v) independent jobs to be carried out in a continuous and regular way and which involve special responsibility and post-secondary level professional knowledge coupled with some years of practical experience and ability to direct and supervise groups belonging to the third and fourth categories above (e.g. head of a group of draftsmen or head of a workshop);

(vi) independent jobs which require sound knowledge, creative capacities, experience in administration and have direct influence in the firm's policy (e.g. head of department).

122. The survey covered only staff falling within the categories (iii), (iv) and (v) above, the two first categories being considered as below and the last as above technician level. The technicians interviewed were found to be working in one of the following departments: study and design, planning and development, production and operation.

123. A typical technician post in the study and design department is the post of draftsman/designer which falls in the fourth category. Technicians in this post collaborate with the head of department in preparing drawing for machines to be constructed and in making the necessary calculations. Oftentimes they are requested to train newly recruited draftsmen.

124. In the planning and development departments technicians assist in studying the feasibility and the economic reporcussions of a given project and oftentimes are expected to plan step by step and control the execution of such projects.

125. In the production and operation departments technicians work as heads of departments, heads of workshops and of control units. In most cases they are in charge of a small group of skilled workers.

126. The basic education and training of the technicians interviewed vary considerably even within the same establishment and for posts which are considered equivalent. Of the technicians interviewed 20 per cent have a Technical Institute diploma, 60 per cent have completed a Vocational Institute and 20 per cent have a middle school certificate or lower formal qualifications. Systematic on-the-job training is rather rare.

127. Management in general is in favour of eventually replacing the "self-trained" technicians with graduates of the technical institutes who, according to their views must have:

(i) a sound general education and be in a better position than at present to express themselves orally and in writing;

(ii) better knowledge of a foreign language;

(iii) scientific knowledge based rather on observations and interpretation of the several phenomena than on memorizing rules and facts;

(iv) more practically oriented training to allow them to pass evenly from school to work and deeper specialization to reduce non-productive periods of employment;

(v) better knowledge of industrial organisation and econmics;

(vi) opportunities for further specialization after an initial period in industry.

Technicians in Electricity

128. In the field of electricity the survey covered one company, the "Società Elettrica SELT-VALDARNO", which is an amalgamation of several electricity producing concerns and possesses 26 hydroelectric and 5 thermal power stations. The primary transmission line of the company runs from the Arsia Power Station in the Belluno province, to the Nera Montuoro Station in the Terni province and the Civitavecchia Station.

129. The total output of the company in 1961 was 2,806 TWh, but plans were in progress to increase this output to 4,356 TWh (2,570 and 1,786 hydro) in the very near future. The

company owns large transformer stations as part of its distribution network and operates two telecommunication systems for internal communication and quick servicing. A total of 3,045 employees distributed as shown in the Appendix 9/I, form the technical staff of the company.

130. Unfortunately the number of technicians interviewed (four) in this particular industry is very small to allow for general conclusions to be drawn. However, the remarks and observations made below incorporate the views and reactions of managerial and supervisory staff and are therefore of value.

131. Two of the technicians interviewed held responsibilities just below those of an engineer; namely they were station managers with a small number of employees directly depending on them. As any manager, they are expected, in case of emergency, to take any immediate steps required which, if poorly implemented, can lead to great harm to the plant and cause inconvenience to the entire community at a large area. Only one of the two above technicians possess a Technical Institute diploma.

132. Of the other two technicians interviewed, one is a member of the technical staff on the switching and remote control side and carries out preventive maintenance on telecommunications, telemetering and remote control equipment. His secondary duties, which require more initiative, are to deal with emergencies in the event of unforeseen breakdowns. The other technician works on installations and wiring of remote control equipment. The work of both the above technicians closely approaches that of a skilled craftsman. The technician in the switching and remote control team possesses a Technical Institute diploma.

133. There is no discrimination made between technicians with or without diplomas from the point of view of remuneration, union rights and promotion. Nevertheless, it is the management's policy to replace technicians without diplomas by those with diplomas as time goes by. Technicians are equally distributed among the various departments - design, organisation, transmission and distribution - and may be broken down by grades as follows: Grade 1 - 33 per cent, Grade 2 - 67 per cent, Grade 3 - 0 per cent.

134. There are 179 technicians with diplomas and 304 without. Among those with diplomas 100 are electricians, 26 skilled mechanics and 53 surveyors. No data are available concerning the educational level of the technicians without diplomas.

135. With regard to on-the-job training, the company has the policy of training by "doubling up" that is, the new workers work side by side with an experienced colleague for a certain period of time. There are no courses available for further training either of a general or of a technical nature but some of the technicians take an "information course" in the instruments division which lasts one year.

136. The management of the company do not consider that specialized courses after basic schooling are of vital importance but they claim they would like to see more stress laid on the problems of the electricity industry during normal instruction with particular attention to electrical measurements and practical exercises in general. They further pointed out that school laboratories should possess models of power stations, substations etc. to supplement the training which is generally given with the help of diagrams. They also recommend more student visits to power stations guided by teachers who would have been briefed accordingly before the visit.

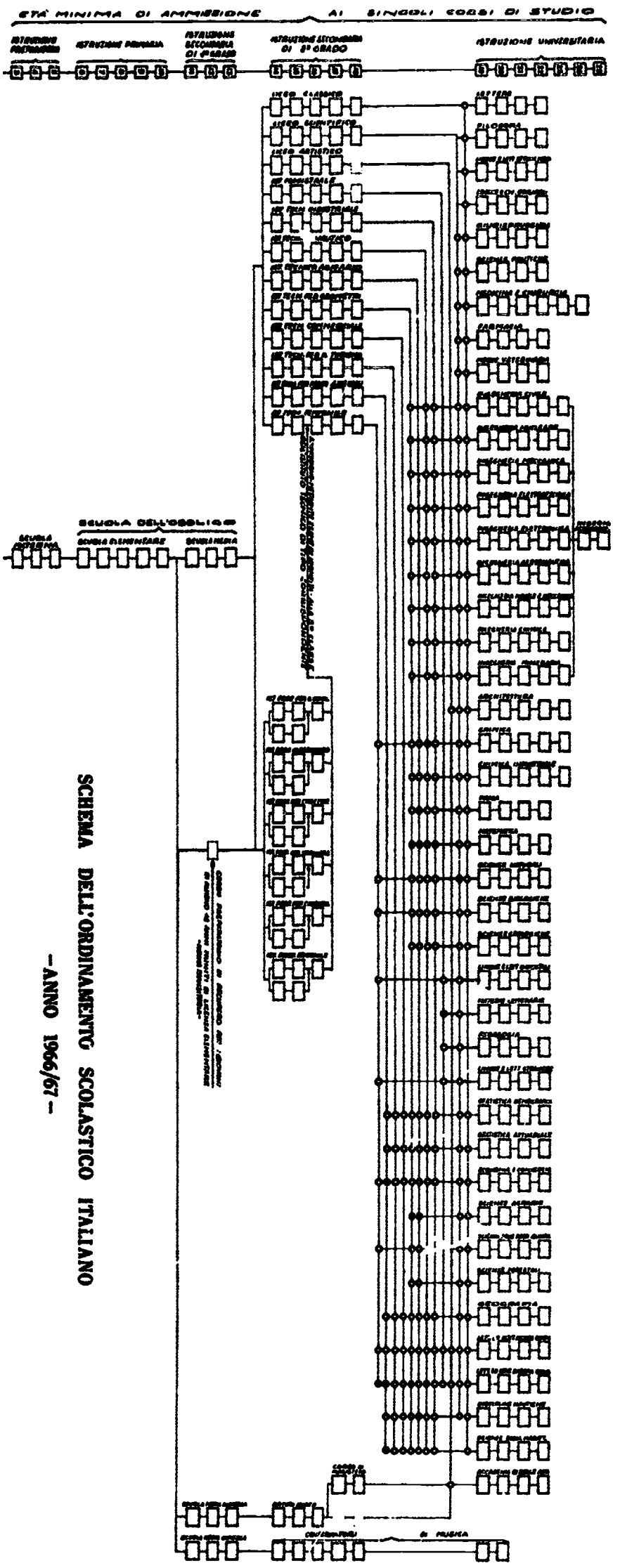
137. On the other hand, technicians were in favour of further training through regular courses to be attended in special schools, to enable them to keep abreast with developments. Should the schools lack the necessary equipment, practical work should be carried out within the industry.

138. It was observed during the inquiry, and confirmed by the management, that even technicians with diplomas must undergo a period of "apprenticeship" before taking over full responsibilities for their job.

139. In theory, any technician, holding a diploma who shows exceptional technical ability and keenness can rise to a fairly important position. It was observed, however, that, save for rare exceptions, the highest position reached in the company was that of a station manager.

140. Both as regards absolute numbers and proportions technicians are of overwhelming importance in the electricity industry and form, with the engineers, the backbone of the company's technical manpower. In view of the decentralized structure of this particular company, technicians occupy positions of high responsibility and standing with more initiative allowed than in other centralized industries, where continuous personal and close control is felt at each successive level.

APPENDICES



SCHEMA DELL'ORDINAMENTO SCOLASTICO ITALIANO

--ANNO 1966/67 --

APPENDIX 3/I

VOCATIONAL INSTITUTES

SELECTED PROGRAMME TIME-TABLES

1. Mechanical electrical

Subjects	Instruction Periods				
	Per week			Total	
	1	2	3	per year	%
1. General	16	12	8	1,260	30.0
Religion	1	1	1	105	
Civic and general culture	5	5	5	525	
Mathematics	4	2	-	210	
Physics	4	2	-	210	
Physical education	2	2	2	210	
2. Technical	8	8	9	875	20.8
Trade Technology and technical drawing	8	8	7	805	
Industrial economics	-	-	2	70	
3. Workshop practice	16	20	23	2,065	49.2
Machine shop, fitting welding, forging					
Total	40	40	40	4,200	100.0

2. Electrical Installations

Subjects	Instruction Periods				
	Per week			Total	
	1	2	3	Per year	%
1. General	16	11	8	1,225	28.5
Religion	1	1	1	105	
Civics and general culture	5	5	5	525	
Mathematics	4	3	-	245	
Physics	4	-	-	140	
Physical education	2	2	2	210	
2. Technical	10	13	12	1,225	28.5
Electrotechnology, Electrical measurements, Electrical installations, Technical drawing	10	13	12		
3. Workshop practice	14	16	20	1,750	43.0
Total	40	40	40	4,200	100.0

3. Radio Assembling and Repairs

Subjects	Instruction periods				
	Per week			Total	
	1	2	3	Per year	%
1. General	16	11	8	1,225	28.5
- Religion	1	1	1	105	
- Civics and General Culture	5	5	5	525	
- Mathematics	4	3	-	245	
- Physics	4	-	-	140	
- Physical Education	2	2	2	210	
2. Technical	10	13	12	1,225	28.5
- Electrotechnology, Radio-technics, Drawing	10	9	8	945	
- Electrical measurements	-	4	4	280	
3. Workshop Practice	14	16	20	1,750	43.0
Total	40	40	40	4,200	100.0

4. Television Assembling and Repairs

(One-year further specialization course to follow No. 3 above)

Subjects	Instruction periods		
	Per week	Per year	%
1. General subjects (Religion, physical education)	3	105	7.5
2. Technical	19	665	47.5
3. Workshop practice	18	630	45.0
Total	40	1,400	100.0

5. Hotel and Catering - Kitchen Service
(Two-year Course)

Subjects	Instruction Periods			
	Per week		Total	
	1	2	Per year	%
1. General	8	8	560	18.2
- Religion	1	1	70	
- Civics and General Culture	5	5	350	
- Physical Education	2	2	140	
2. Technical	14	14	980	31.8
- French Language	5	5	350	
- Food Technology	4	4	280	
- Raw Materials	2	2	140	
- Food Hygiene	1	1	70	
- Principles of Administration	2	2	140	
3. Practical Work	22	22	1,540	50.0
Total	44	44	3,080	100.0

Appendix 3/II

VOCATIONAL INSTITUTE PROGRAMMES

Job profile, examination requirements and curriculum outline for the trade of Electrician (electromechanic)

ELECTRICIANS

Job Description

The electrician installs electrical machinery and equipment with parts, some of which he makes himself and some of which are already prefabricated but may require final modification.

Normal length of education cycle: three years.

EXAMINATIONS

A. Practical Test

(1) Trouble-shooting and repair of an electrical machine involving rewinding and possibly the manufacture of a simple part using common machine-tools.

(2) Assembly of appliances or parts of electrical machines (both mechanical and electrical parts) in accordance with a detailed drawing, using a machine-tool to make some of the parts.

(3) Installation of an electrical machine and wiring of its control board.

B. Drawing Office Practice

Execution of a drawing on a set subject (design details of an electrical machine or equipment).

C. Oral Test

The candidate has to demonstrate that he has adequate general and scientific knowledge and instruction in citizenship.

The candidate must show he has a good command of the following: basic laws of electricity, direct and alternating current, single-phase and three-phase systems and power factors, and the operation and design of the main types of electrical machine and equipment.

The technology of the conductive, insulating and magnetic materials he will be using in his trade; the technical and cost aspects involved in their choice; the factors governing choice of measuring instruments and the correct way to use them.

The factors governing the design and operation of common testing, measuring, safety and protection equipment. The candidate must also be capable of wiring up a control board incorporating these instruments.

the installation and manipulation of various types of electrical household equipment;

the I.E.C. standards for electrical installations, equipment and machines;

the ability to read and correctly interpret electrical drawings and symbols.

The candidate should be acquainted with the use of the main types of machine-tool, namely the lathe, milling machine, shaper drill, saw, etc. and be capable of executing the main fitting operations.

The candidate must also know the basic standards of social legislation concerning contracts of employment, accident prevention, industrial health and standards governing the activity and management of the craft trades: He should be capable of preparing a budget and a cost sheet.

CURRICULUM

Subject	Hours per week I	II	III	Total
Religion	1	1	1	105
General knowledge and instruction in citizenship	5	5	5	525
Mathematics	4	3	-	235
Physics	4	-	-	140
Trade skills (electricity, mechanics, drawing electro-mechanical design and electrical instrument shop)	10	13	12	1 225
Workshop practice	14	16	20	1 750
Physical education and recreation	2	2	2	210
TOTAL	40	40	40	4 200

SYLLABUS (Trade Skills)

(Electricity, mechanics, drawing, electro-mechanical design and electrical instrument shop).

General Observations

Vocational training must also include workshop practice; this instruction is the basis not only for the work of the trainees in the workshops and laboratories, but must also give them a full understanding of the concepts which will enable them to gain the most benefit from the practical work and texts concerning their speciality.

The sections of the syllabus on materials, methods of work and measuring and testinginstruments must be developed in fairly close step with each other, since to carry out the practical periods effectively, one cannot wait to finish one section before going on to the next.

Clearly, the machines, equipment, tools and instruments used in the workshops and laboratories are additional aids in technical and vocational instruction.

Lastly, one should not lose sight of the fact that the continuous advances made in materials and technical methods, together with the specific needs of the trade, call for constant updating and unification of syllabuses by the education authorities.

A. Electricity

Basic electrical circuit; measuring units; Ohm's Law and its applications; expression of electricity in quantitative terms; Kirchoff's principle; Joule's Law and its application; permanent magnets and electromagnets; magnetic fields and magnitudes; the magnetic circuit; Hopkinson's Law; magnetic fields generated by current; electromagnetic induction;- the basics of electrostatics; capacitors; discharges in gases; dc generators; batteries and accumulators; alternating current; reactance and impedance; power and power factor; phase synchronisation; three-phase ac; star and delta connections; transformers; rectifiers; rotating magnetic fields; the operating principles of the main electrical machines: dynamo, dc motors, alternators, ac motors (synchronous and asynchronous) - the basics of special electrical machines.

B. Mechanics

Strength of materials - the basics of how iron and steel products are produced: pig-iron, steel and cast-iron; special steels; basics of alloys of other metals, bronze, copper and silver alloys, welding alloys, anti-friction alloys, aluminium alloys white metal, cold working of metals; basic fitting operations; machining of metals on machine tools; general principles and classification of lathes, drills, shapers, planing machines, slotting machines, millers, broaching machines and grinders; schedules of machine-shop operations; fundamentals of heat-treatment and welding.

C. Drawing Office Practice

Recapitulation of standard practices for geometrical constructions and orthogonal projections relating to technical applications; standard practices for mechanical drawing; full size sketches and scaled down drawing of simple mechanical parts; IEC graphical symbols; electrical line drawings; working drawings; sketches and drawings of electro-mechanical appliances; winding diagrams; electrical schematic diagrams and working drawings for wiring distribution boards, control boards, monitoring boards, and protection boards; drawings of electrical machine components; reading and explanation of technical drawings relevant to the trade.

D. Electro-mechanical Machines

Conductive, insulating and magnetic materials; basics of lighting, display and power systems; equipment used in electro-mechanical installations; control, regulating and protective devices; mechanical driving and actuating systems; distribution and control boards; dimensioning of connections; electrical plate and laminations; windings for electric machines; components of electrical machines; winding; insulation of windings and machines; effective and accepted efficiency of electrical machines; structural parts of electrical machines; the winding operation; handling and the trouble-shooting and repair of faults on electrical machines; the basics of the main types of electrical motor.

E. Instrument Shop

Electrical measuring instruments: type, application, symbols and errors; measurement of current, voltage, resistance, power and power factors; measurement of energy; meters and their insertion in single and three-phase circuits; plotting the characteristic operating curves of electrical machines; shunt connection of electrical machines; calibration of instruments; measurement of insulations; measuring and testing of work carried out in the electro-mechanical workshop.

F. Miscellaneous

Accident prevention and industrial hygiene; the basics of commercial accounting.

WORKSHOP PRACTICE

General Observations

These exercises are performed to drawings comprising the necessary instructions, which emphasize the value of the exercises.

The student has to follow the set syllabus to produce and fit the parts to the same specifications of accuracy as is required for manufacturing electro-mechanical equipment.

Guidance towards specialization is provided by carrying out suitable maintenance operations in the workshops, where the student becomes acquainted with his future trade. He is also instructed in rapid trouble-shooting of faults on electrical machines.

A. Fitting, machining and metal-working operations related to electro-mechanical work

(1) simple fitting tasks;

(2) forging - forging of tools in special steel, together with the relevant heat-treatment;

(3) exercises of increasing difficulty using machine-tools, including (a) lathe (b) drill (c) shaper (d) miller;

(4) cold sheet metalwork;

(5) soldering;

(6) oxyacetylene and arc welding;

(7) various methods of working plastics.

B. Electrical installations

Connection of conductors - simple lighting, display and power systems with various types of conductors, with direct and remote-control using a variety of devices.

C. Electro-mechanical work

Installation of electro-mechanical devices and switchboards; windings for light electrical machines; construction of light electro-mechanical equipment; construction of the mechanical and electrical components of electrical machinery; repair, handling and trouble-shooting on electro-mechanical and electrical machines; construction and operation of the common types of testing, control, safety and protection instruments, apparatus and systems, and wiring of the necessary control boards; installation and handling of various types of household electrical equipment; particular attention is paid to accident prevention.

Appendix 4/I

TECHNICAL INDUSTRIAL INSTITUTES

LIST OF STATE INSTITUTES IN 1967/68

(Location and Specializations available)

Location/Name	Specializations(1)						
	M	E	IE	T	IC	MM	Other
A. State Institutions							
1. Agordo (V. Follador)	-	-	-	-	x	-	Mining
2. Aléssandria(*) (A. Volta)	x	x	-	-	-	-	-
3. Ancona(*) (Vito Volterra)	x	x	-	-	-	-	-
4. Andria(*) (Bari)	x	-	-	x	-	-	-
5. Arezzo	-	-	-	-	x	x	Ind. Physics
6. Arzignano (Vicenza)	-	-	-	-	x	-	-
7. Ascoli Piceno	-	x	-	-	x	-	Plastics
8. Asti(*) (Alessandro Artom)	-	x	-	-	-	x	-
9. Aversa	x	-	-	-	-	-	-
10. Bari(*) (G. Marconi)	x	-	-	-	x	x	Heating Techniques
11. Bari(*) (M. Panetti)	-	x	x	x	-	-	-
12. Bassano(*) del Grappa	x	x	-	-	-	-	-
13. Belluno(*) (G. Segato)	x	x	x	-	-	x	Building
14. Benevento	x	x	-	-	-	x	Heating Techniques
15. Bergamo(*) (P. Paleocapa)	x	x	-	-	x	-	Textiles, Dyeing
16. Bibbiena (Arezzo)	x	x	-	x	-	-	-
17. Biella (Vercelli)	x	x	-	-	-	-	Building, Textiles, Dyeing
18. Bologna(*)	-	x	x	-	-	x	Precision mech. Ind. Physics
19. Bolzano (G. Galilei)	x	x	-	-	-	-	-
20. Bolzano II (in German)	x	x	-	-	-	-	-
21. Brescia(*) (Benedetto Castelli)	x	x	x	-	-	-	Metallurgy
22. Brindisi(*) (Giovanni Giorgi)	-	-	x	x	x	-	-
23. Busto Arsizio (Varese)	-	-	-	-	-	-	Textiles, Dyeing, Knitwear
24. Cagliari (Dionigi Scano)	x	x	-	-	x	-	Building
25. Caltanissetta (S. Mottura)	-	-	-	-	-	-	Mining
26. Campobasso(*) (G. Marconi)	x	x	-	-	-	-	-
27. Carrara (Massa)	-	-	-	-	x	-	-
28. Caserta(*) (Francesco Giordani)	x	x	-	-	-	-	-
29. Catania (Archimede)	x	x	x	x	-	x	-
30. Catania(*) (Stanislao Cannizaro)	x	x	x	x	-	-	-
31. Catanzaro(*) (E. Scalfaro)	x	x	x	x	-	-	Building
32. Cesena (Forli)	-	-	x	x	-	-	-
33. Chieti(*)	x	x	-	x	x	-	-
34. Civitavecchia (Roma)	-	x	-	-	-	-	-
35. Como (P. Carnaro)	-	-	-	-	-	-	Textiles, Dyeing Fabric Designing
36. Como (Magistri Cumacini)	x	x	-	-	-	-	Building
37. Conegliano (Treviso)	x	x	-	-	-	-	-

	Location/Name	Specializations						
		M	E	IE	T	IC	MM	Other
38.	Cosenza(*) (A. Monaco)	x	x	-	-	-	-	-
39.	Cremona(*)	x	x	-	-	x	-	-
40.	Crotone(*) (Catanzaro)	x	-	-	-	x	-	-
41.	Cuneo(*)	x	x	-	-	x	x	-
42.	Ebcli(*) (Salerno)	x	x	-	-	-	-	-
43.	Fabriano (Ancona)	-	-	-	-	x	-	Paper industry
44.	Fermo (Ascoli Piceno)	x	x	x	x	x	-	-
45.	Ferrara(x) (Nicolo Copernico)	x	x	-	-	x	-	-
46.	Foggia(x) (S. Altamura)	x	x	-	-	-	-	-
47.	Foligno(*) (Perugia)	x	x	-	x	-	x	-
48.	Forli	x	x	-	-	x	x	Food industry Heating techniques
49.	Frosinone(*)	x	x	-	-	-	-	-
50.	Fuscaldo (Cosenza)	x	-	-	-	-	-	-
51.	Gallarate (Varese)	-	-	x	x	-	-	Textiles
52.	Gela (Caltanissetta)	-	-	-	-	x	-	-
53.	Genova(*) (G. Giorgi)	x	x	-	-	-	-	-
54.	Genova - Sampierdarena	-	-	-	-	x	-	-
55.	Giarre (Catania)	x	x	-	-	-	-	-
56.	Gioia del Colle (Bari)	x	-	-	-	-	-	-
57.	Giulianova (Teramo)	x	x	-	-	-	-	-
58.	Gorizia(*) (G. Galilei)	x	x	-	-	-	-	-
59.	Grosseto (Porzio Porciatti)	x	x	-	-	-	-	-
60.	Iglesias (Cagliari)	-	-	-	-	-	-	Mining
61.	Imola (Bologna)	x	-	-	-	-	x	-
62.	Isola del Liri(*) (Frosinone)	x	x	-	-	-	-	-
63.	Ivrea(*) (Torino)	x	x	-	-	-	-	-
64.	L'Aquila	x	x	-	-	x	-	-
65.	La Spezia	x	x	x	-	-	x	Marine mechanics
66.	Latina(*) (G. Galilei)	x	x	-	-	-	-	-
67.	Lecce(*) (Enrico Ferni)	x	x	-	-	-	-	-
68.	Lecce (Como)	x	x	-	-	-	-	-
69.	Legnano (Milano)	x	x	-	-	-	x	Textiles
70.	Livorno(*)	x	x	x	-	x	-	Nuclear Energy, Ind. Physics
71.	Lodi (Milano)	-	x	-	-	-	x	-
72.	Lucca	x	-	-	-	-	-	-
73.	Mantova	x	x	x	-	x	-	-
74.	Massa(*)	-	x	-	-	-	x	-
75.	Massa Maritima (Grosseto)	-	-	-	-	x	-	Mining
76.	Matera	-	x	-	-	x	-	
77.	Mazara del Vallo (Trapani)	x	x	-	-	-	-	-

Location/Name	Specializations						
	M	E	IE	T	IC	MM	Other
78. Messina(*) (Verona-Trento)	x	x	-	x	-	-	Building
79. Milano(*) (Conti)	x	x	-	x	-	-	-
80. Milano(*) (Feltrinelli)	-	x	x	-	-	x	Nuclear energy Aircraft construction Heating techniques
81. Milano(*) (G. Galilei)	-	x	-	-	-	-	Optical instr. Precision mech.
82. Milano(*) (Molinari)	-	-	-	-	x	-	Ind. Physics
83. Milano(*) (L. Galvani)	x	x	-	-	-	-	-
84. Milano (G. Giorgi)	x	x	-	-	-	-	-
85. Milano VII	x	x	-	-	-	-	-
86. Mirandola (Modena)	-	x	-	-	-	-	-
87. Modena (Fermo Corni)	-	x	-	x	-	x	Ind. Physics Nuclear energy Heating techniques
88. Monza(*) (Milano)	-	x	-	-	-	x	Metallurgy
89. Napoli (L. da Vinci)	-	-	-	-	x	-	Textiles, Dyeing, Ind. Physics
90. Napoli(*) (A. Volta)	x	x	-	-	x	-	-
91. Napoli(*) (E. Fermi)	-	-	-	-	-	x	Building construction, Aircraft construction, Heating techniques
92. Napoli IV	-	-	-	-	x	-	-
93. Napoli V	-	-	x	x	-	-	Nuclear Energy
94. Novara (via Brusati)	-	-	-	-	-	-	Textiles, Knitwear
95. Novara (Omar)	x	x	x	-	-	-	Aircraft construction
96. Padova(*) (G. Marconi)	x	x	-	-	x	x	Heating techniques
97. Palermo(*) (Vittorio Em.III)	x	x	x	x	x	x	-
98. Palermo II	-	-	-	-	-	-	Food Industries, Plastics
99. Parma(*)	x	x	-	-	-	-	-
100. Pavia	x	x	-	-	-	-	-
101. Perugia(*)	-	x	-	-	x	-	Ind. Physics
102. Pescara	x	x	-	-	x	-	-
103. Piacenza (G. Marconi)	x	x	x	x	-	x	-
104. Piazza Armerina (Enna)	x	x	-	-	x	-	-
105. Piombino(*) (Livorno)	x	x	-	-	-	-	-
106. Pisa(*) (L. da Vinci)	x	x	-	x	-	x	Aircraft construction, Building, Ind. Physics
107. Pistoia	x	-	-	-	-	-	-
108. Pomigliano d'Arco (Napoli)	x	x	-	-	-	-	-
109. Pordenone (Udine)	-	-	-	-	x	x	-
110. Portogruaro	x	-	-	-	-	-	-
111. Potenza(*) (Albert Einstein)	x	-	-	-	-	-	-
112. Prato (Firenze)	x	-	-	-	-	x	Textiles, dyeing
113. Pratola Peligna (L'Aquila)	x	-	-	-	x	-	-
114. Ragusa	-	-	-	-	x	-	-

Location/Name	Specializations						
	M	E	IE	T	IC	MM	Other
115. Ravenna(*) (Nullo Baldini)	x	x	-	-	x	-	-
116. Reganati (Macerata)	x	-	-	-	x	-	-
117. Reggio Calabria(*) (A. Panella)	x	x	-	-	x	-	-
118. Reggio Emilia(*) (L.Nobili)	x	x	-	-	-	-	-
119. Rho (Milano)	-	-	-	-	x	-	Nuclear Chemistry
120. Rimini (Forli)	-	x	-	-	-	-	-
121. Rivarcio Canavese (Torino)	x	-	-	-	-	-	-
122. Roma (G. Armellini)	-	x	-	-	-	-	Precision mech. Watch making
123. Roma (Bernini)	-	-	-	-	x	-	Building
124. Roma (E. Fermi)	-	-	x	x	-	-	Nuclear energy
125. Roma (G. Galilei)	x	x	-	x	-	-	Aircraft construction, Building
126. Roma(*) (A. Meucci)	x	x	-	x	-	-	-
127. Roma (G. Marconi)	x	x	-	x	-	-	-
128. Roma(*) (Giovanni XXIII)	x	x	-	x	x	-	-
129. Roma VIII	-	-	-	x	-	-	-
130. Rovigo(*) (F. Viola)	x	x	-	-	x	-	-
131. Salerno (G. Galilei)	x	x	-	-	x	-	-
132. San Severino Marche(*) (Macerata)	x	x	-	x	-	-	-
133. Saronno (Varese)	x	x	-	-	-	-	-
134. Sassari (G. M. Angioy)	x	-	-	-	x	-	-
135. Savona (G. Ferraris)	x	x	-	-	x	-	-
136. Scafatu(*) (Salerno)	x	x	-	-	-	-	-
137. Schio (Vicenza)	x	x	-	-	-	-	-
138. Siena(*) (Tito Sarrocchi)	x	x	-	x	x	-	Building
139. Siracusa(*) (E. Fermi)	x	-	-	-	x	-	-
140. Sondrio	x	-	-	-	-	-	-
141. Taranto (A. Righi)	x	x	-	x	-	x	-
142. Teramo	x	x	-	-	-	-	-
143. Terni(*)	x	x	x	-	x	x	Metallurgy
144. Tivoli (Roma)	-	x	-	-	-	-	-
145. Torino (Giambattista Bodoni)	-	-	-	-	-	-	Graphic Arts, Photography
146. Torino (Avogadro)	x	x	-	-	-	-	Aircraft construction Nuclear energy
147. Torino (G. Baldracco)	-	-	-	-	-	-	Tanning
148. Torino (Luigi Casale)	-	-	-	-	x	-	-
149. Torino (Giuseppe Peano)	-	-	x	-	-	-	-
150. Torino (Giovanni Battista Pininfarina)	-	-	-	x	-	-	Nuclear energy

Location/Name	Specializations						
	M	E	IE	T	IC	MM	Other
151. Torino (via Paganini)	-	-	-	-	-	-	Textiles, Dyeing
152. Torre Annunziata (Napoli)	x	x	-	-	-	-	-
153. Trento(*) (M. Buonarroti)	x	x	-	-	-	-	Building
154. Treviglio (Bergamo)	x	x	-	-	-	-	-
155. Treviso(*) (E Ferini)	x	-	-	-	x	-	-
156. Trieste (A. Volta)	x	x	-	x	-	x	Building, Heating techniques
157. Udine(*) (A. Molignani)	x	x	x	-	-	x	Aircraft construction Building
158. Urbino (E. Mattei)	-	x	x	-	x	x	-
159. Valdagno (Vicenza)	-	-	-	-	x	-	Textiles, Dyeing
160. Varese	x	-	-	-	-	-	Textiles, Plastics
161. Vasto (Chieti)	x	x	-	-	x	-	-
162. Venezia - Mestre(*) (A. Pacinotti)	x	x	x	x	x	-	Metallurgy
163. Verbania(*) (Novara)	x	x	-	-	x	-	-
164. Vercelli	x	x	-	-	x	-	-
165. Verona(*) (G. Ferraris)	x	x	-	-	-	-	-
166. Vibo Valentia (Catanzaro)	x	x	-	-	x	-	-
167. Vicenza(*) (A. Rossi)	x	x	-	x	-	-	Metallurgy
168. Viterbo(*)	x	x	-	-	-	-	-

(1) M = Mechanics, E = Electrotechnics, IE = Industrial Electronics, T = Telecommunication, IC = Industrial Chemistry, MM = Metal Mechanics.

(*) Institutes marked with an asterisk have one or more annexes in the same or in another town.

Appendix 4/II

TECHNICAL INDUSTRIAL INSTITUTES

SELECTED PROGRAMME TIME-TABLES

(Specialized cycle)

1. Mechanics

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1 General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and science	6	2	0	2
Mathematics	3	3	-	6
Chemistry(2)	3	-	-	3
3. Technical	22	27	28	77
Mechanical construction(3)	4	4	6	14
Mechanical technology(2)	5	5	8	18
Applied mechanics	4	3	2	9
Fluid mechanics and hydraulic machines	-	3	6	9
Electro-technology	-	4	-	4
Workshop practice	9	8	6	23
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

(3) Drawing and manufacturing projects.

2. Metal Industries

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and Science	6	3	0	9
Mathematics	3	3	-	6
Chemistry(2)	3	-	-	3
3. Technical	22	27	28	77
Mechanical construction(3)	4	4	8	16
Mechanical technology(2)	5	6	12	23
Fluid mechanics and hydraulic machines	5	5	-	10
Electrotechnology	-	4	-	4
Workshop practice	8	8	8	24
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

(3) Drawing and manufacturing projects.

3. Electrotechnics

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and Science	6	4	0	10
Mathematics	4	4	-	8
Chemistry	2	-	-	2
3. Technical	22	26	28	76
General electrotechnology	5	4	4	13
Electrical measurements(2)	2	4	8	14
Electrical installations and drawing	2	4	6	12
Electromechanical constructions(3)	3	4	4	11
Mechanics and hydraulic machines	4	4	-	8
Workshop practice	6	6	6	18
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

(3) Technology and design.

4. Industrial Electronics

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and Science	6	4	0	10
Mathematics	4	4	-	8
Chemistry	2	-	-	2
3. Technical	22	26	28	76
General electro-technology(2)	9	3	-	12
General electro-nics(2)	-	9	8	17
Industrial electro-nics(3)	-	-	8	8
Technical drawing	3	3	4	10
Technology (general and electric construction)	3	2	3	8
Mechanics and machines	3	4	-	7
Workshop practice	4	5	5	14
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

(2) Including measurements and laboratory work.

(3) Including control, servo-mechanisms and other applications.

5. Telecommunications

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and science	6	4	0	10
Mathematics	4	4	-	8
Chemistry	2	-	-	2
3. Technical	22	26	28	76
General electro-technology	6	3	-	9
Radio-electronics	-	7/	6	13
Electrical and electronic measurements	3	4	6	13
Telegraphy and Telephony	-	3	4	7
Technical drawing	2	3	4	9
Elementary mechanics and machines	3	-	-	3
Technology (general and electronic construction)	2	2	2	6
Workshop practice	6	4	6	16
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

6. Industrial Chemistry

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and science	12	8	0	20
Mathematics	3	2	-	5
Physics(2)	3	-	-	3
General chemistry(2)	6	6	-	12
3. Technical	16	22	28	66
Industrial chemistry	-	3	4	7
Advanced chemistry and electrochemistry(2)	3	2	4	9
Analytical chemistry(3)	13	9	15	37
Machines	-	2	-	2
Electrotechnology(2)	-	3	-	3
Chemical plants(4)	-	3	5	8
TOTAL	38	38	38	114

(1) In units: One unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

(3) General and technical; including laboratory work.

(4) Including drawing.

7. Building Construction

Subjects	Instruction periods per week			
	3rd year	4th year	5th year	Total(1)
1. General	10	8	10	28
Scripture	1	1	1	3
Italian (language and literature)	3	3	3	9
Foreign language	2	-	-	2
History and civics	2	2	2	6
Law and economics	-	-	2	2
Physical training	2	2	2	6
2. Mathematics and science	8	3	0	11
Mathematics	3	3	-	6
Chemistry	2	-	-	2
Applied physics	3	-	-	3
3. Technical	20	27	28	75
Technical drawing	2	3	3	8
Construction drawing	4	4	4	12
Mechanics	2	-	-	2
Machines (elements)	-	3	-	3
Building, road construction and hydraulic installations	2	4	3	9
Topography	-	2	4	6
Building materials technology(2) and organisation of the building yard	3	4	5	12
Estimating	-	-	2	2
Workshop practice	7	7	7	21
TOTAL	38	38	38	114

(1) In Units: One unit corresponds to approximately 40 instruction periods.

(2) Including laboratory work.

Appendix 4/III

TECHNICAL INSTITUTES

CURRICULUM OUTLINE FOR SURVEYING

(Selected technical subjects)

MATHEMATICS

Comments

In technical institutes for surveyors, the following are the objectives it is hoped to achieve through instruction in mathematics:

(1) to encourage the student to think and reason;

(2) to instil in him the practice of clear and accurate presertation;

(3) to encourage him to acquire confidence and speed in calculation by solving practical problems and to keep an increasingly active contact with the real life world through both cultural and professional interest.

Since it is mainly a means of training, education will be principally deductive. However, a policy of turning quite deliberately to intuition and experience will be practised, especially for introducing and instilling basic concepts.

The use of diagrams up to the start of class 2 will help to elucidate concepts and methods and will also be a valuable aid to instruction in other subjects.

The students should be accustomed to using the formula given in practical handbooks and making order-of-magnitude approximations.

After completion of the initial vocational training of the students the instructor highlights the relationships between mathematics and other subjects and enlarges on various points in proportion to their importance.

Class I (5 hours)

Arithmetic and Algebra

Recapitulation of calculation of fractions, the decimal system and non-decimal systems; periodic numbers and their generation; elementary approximate calculation; numerical fractions and their properties; directly and inversely proportional numbers; rational numbers, plotting of rational numbers using linear co-ordinates and the corresponding operations; literal calculation; monomials, polynomials and the corresponding operations, significant products and breakdown into polynomial factors; operation involving algebraic fractions.

Operation involving algebraic fractions; equations; first degree systems and related problems; elementary theory of real numbers.

Geometry

The point, straight line, plane, segments and angles; perpendiculars and parallel lines; triangles and their properties; the elements of similar triangles; congruent planar figures; triangles and polygons; the properties of angles and the perimeter of polygons; parallelograms; properties and special cases; loci; the circumference and the circle; intersection of straight lines and circles; centre and inscribed angles; regular polygons and how to construct them with ruler and compass; congruance of polygons.

Class II (4 hours)

Arithmetic and Algebra

Real numbers and the basics of how to manipulate them; calculation of square roots and rational exponent powers; equations and second degree problems with one unknown or which can easily be reduced to the second degree; simple equations higher than the first degree; orthogonal cartesian co-ordinates; the concept of a function; graphical representation of a single variable function; specific study of equations of the $ax + b$; $ax^2 + bx + c$; a/x etc. type. Graphical solution of equations and combinations of equations; circular functions and their graphical representation; the trigonometry of the sides and angles of right-angle triangles; use of natural value tables; applications of algebra to geometry (with numerical examples).

Geometry

Measurement of magnitudes; proportional magnitudes; similar polygons and the basics of similitude of planar figures; the intuitive concept of congruence of planar figures; area of polygons; area of the circle and length of its circumference; sectors and circular arcs; straight lines and planes in space, perpendiculars and parallel lines; distances and angles; congruance of solids; dihedral angles; symmetry; prisms, pyramids, regular polyhedrals and volumes of revolution, including in particular the cylinder, cone and sphere; the concept of similitude in space; practical rules for working out the area and volume of the solids studied and practical applications in various professions; Guldin's theory.

Class III (3 hours)

Algebra and Geometry

The elements of the power function with real exponents; exponential and logarithmic functions and their graphical representation; theorems for logarithmic calculations; base-ten logarithms; use of logarithmic tables and the slide-rule; arithmetical and geometrical progressions; the arithmetic, weighted and geometric mean; simple and compound interest; discount; annuity and periodic values; applications of algebra in geometry using examples lending themselves to discussion; geometrical locus equations; cartesian co-ordinate representation of curves of a given equation; circumference, ellipse, hyperbola, parabola and so on.

PHYSICS

Comments

The prime purpose of this instruction is to lay the groundwork for the scientific knowledge of the students and also the knowledge vital to study of technical and professional disciplines.

The teacher invariably highlights the relationships between physics and other subjects in the vocational training given, placing particular stress on certain points in proportion to their importance.

Experimental work figures prominently in the lessons, which are supplemented by collective and individual practical exercises on the main phenomena studied. The students have to write up the individual exercises.

Class I (2 hours)

Mechanics

General motions; physical magnitudes and their measurements, the measuring units of the M.K.S. (meter-kilogram-second) system; uniform, varying and uniformly varying motions; circular and harmonic sinusoidal motions; the components of motion; components of co-planar forces; torque; gravity; centres of gravity; conditions of equilibrium of a free and constrained body; balance of forces in simple machines; the laws of dynamics and their applications (fall of heavy bodies, the pendulum, centrifugal force impulse and momentum); work, energy and power; conservation of energy; the elements of universal gravitation; basics of friction; basic properties of liquids and gases and the elements of their main applications.

Class II (2 hours)

Acoustics

Vibratory motions and sound; the nature and propagation sound; sonic interference and resonance; ultrasonics and its applications;

Optics

Propagation of light; the basics of photometry; reflection and refraction; mirrors, prisms and lenses; the main optical instruments; scatter of light; spectra; interference fringes, defraction and polarisation; elements of modern theories of light.

Heat

Thermometry and heat expansion; calorimetry; propagation of heat; changes of state; heat as an energy source; principles of thermodynamics and the operation of modern heat engines.

Class III (3 hours)

Electricity

The main electrostatic phenomena involved in atomic structure; capacitors; electric currents viewed as flows of electrons, and their effects; the laws of the DC circuit; flow of current in liquids and gases; magnetism and electromagnetism; technical applications; electromagnetic induction; alternating currents; elements of electrical generating machines, electric motors and transformers; transmission of energy; electromagnetic oscillations, electromagnetic waves and telecommunications; modern thinking on the nature of matter; the basics of generation of nuclear power and the technical application of electronics.

CHEMISTRY

Comments

The various subjects in the syllabus are treated simply, to suit the mentality of the pupils.

The course provides elementary instruction in all the concepts necessary to an understanding of this subject. When dealing with the various subjects of organic and inorganic chemistry, particular stress is laid on the ones directly related to the needs of the profession.

To ensure that the training is practical, the students carry out analyses and experiments in the laboratory.

Class I (2 hours)

Matter; atoms and molecules; atomic structure; simple and compound bodies; the periodic table; metals and other bodies; chemical chains; valency and oxidation number; chemical reactions and equations; stoichiometric calculations; the main types of inorganic compound; the fundamental laws of chemistry; chemical equilibrium; the law of mass action; electrolytic dissociation; electrolytes and non-electrolytes; pH; elements of electrochemistry and thermochemistry; the electrochemical series; air; water; halogens and their compounds; chlorine; sulphur, sulphuric acid, sulphur dioxide and sulphur trioxide; sulphuric acid and the sulphuric acid industry.

Class II (3 hours)

Nitrogen, ammonia and ammonia salts; the oxygenated compounds of nitrogen; nitric acid and the nitric acid industry; phosphorus, phosphoric acid, phosphates and superphosphates; arsenic and antimony; carbon and carbon compounds; natural and man-made carbons; silicon, silicon dioxide, silicic acid, silicates and silicones, glasses; boron and boric acid; borates; colloids and colloidal solutions; metals; chemical and physical properties; compounds and the major alloys; carbon compounds; gross and detail formulae; hydrocarbons; asphalt, bitumen and tars; alchols, aldehydes, acetones and acids; glycerine and nitroglycerine; fats and soaps; carbohydrates; a brief description of natural and man-made textile fibres; aromatic derivatives; colouring matter; synthetic resins.

Class II (2 hours)

Elements of chemistry applied to building materials; natural and artificial stones; chemical treatment of wooden frames; bonding materials; limes, plasters and cements; gravels, sands, puzzolana; water for building work; mortars and concretes; plastics and their use in the building industry; dyes, paints and glasses.

Exercises (1 hour)

Practical work and other exercises on the applied chemistry programme and in particular the use of building materials.

ENGINEERING DRAWING AND ARCHITECTURE

Comments

The purpose of this course is to give the students a thorough acquaintance with the rules of draughtsmanship. Without going any further in draughtsmanship than the principles of pure geometry, the teacher gives a full explanation of each of the rules given and spares no efforts to demonstrate their application.

The teacher follows and guides the progress of the students, continuously checking that they are working rationally, among other things through oral questioning.

In freehand sketching from nature, the teacher shows the students how to use light and shadow and colours. Much of the instruction is set aside for teaching UNI standards on how to set engineering drawings.

Class I (4 hours)

Principles of orthogonal projection; simple problems on plotting points, straight lines, planes, planar figures and geometrical solids; dimensioned sketches of simple objects drawn from nature; elementary architecture; scale representation and orthogonal projections of objects and architectural details; lettering; use of normography; UNI standards.

Class II (4 hours)

The principles of axonometric projection; applications of axonometric projection for the portrayal of objects of more complex shape and in particular the customary joints and mortices used for wood and steel frames; simple cross-sections, intersections and developed sections; dimensioned sketches drawn from nature.

Class III (2 hours)

The principles of perspective, explained in the simplest way possible; application of perspective to the design and internal layout of small buildings; the elements of the various architectural styles; trends and characteristics of modern architecture; dimensioned sketches drawn from nature.

VALUATION

The course starts by illustrating a number of financial calculations involved in making a valuation i.e. a guide to the presentation and interpretation of a number of financial formulae that the valuer can use to make the valuation. The student is advised to adopt international mathematical symbols.

In class IV, the teacher expounds the principles of valuation to elucidate its specific nature, stressing that it must agree with reality, and explains the characteristics of the valuation method. The students then apply these principles to valuations in class V, both for rural areas and for urban structures and apply them to the methodology of the new land cadastre and the urban building cadastre.

Stress is laid during the practical exercises not only on the many difficulties the future valuer will have to tackle in his trade, but also all the methods of solving the various problems that will be put to him.

The teacher also explains in the exercises the old cadastre applying in the region where the institute is located and shows its relationship with the new cadastre. In regions where a special cadastre still exists, the teacher will have to describe it in sufficient detail.

Class IV (2 hours)

Financial calculations; the concept of capital and interest; the inter-relationships of capital, interest and time; the appreciation and depreciation of capital; calculations concerning regular and irregular values; depreciation and amortization; calculation of average values and distribution of values; use of financial tables and calculating machines;

The principles of valuation.

The practical aims and scientific nature of valuation; judgement in valuation as a research subject and its characteristics; the purpose and objective of valuation; cost, utility and price as factors in valuation; the general concept and methods of application of valuation; the nature of the valuation method; comparison parameters; examples of the various methods that can be used to make a valuation of the price, cost and utility of an economic good.

Class V (2 hours)

Rural valuation; valuation in an agricultural undertaking; liquidation; valuation of small plots of ground; valuation of farm stocks, crop forecasts, fruit on the tree and residues; valuation of herbaceous crops over several years, orchards and forests; the cost of estovers; valuation of land improvement schemes; land improvement indemnity; valuation of plots to be subjected to land improvement; valuation of awards for damages, expropriations and occupancy; valuation of obligations and real rights with respect to property of third parties; valuation of emphytenses and redemption costs; valuation of stretches of water and water courses, grassland, gardens, etc.; valuation of the distribution of costs incurred for work carried out jointly by a group; valuation of division through inheritance; valuation of credit for the purchase of land and for land improvement.

Valuation of buildings

Valuation of public buildings and land for construction; valuation of joint ownership costs; valuation of damage to public buildings;

Cadastral valuation

The aspect and functions of the new land and urban cadastre current legislation concerning maintenance of the cadastre operations involved in making the new cadastre, especially from the standpoint of setting valuation rates and taxable incomes; relationship with the urban building cadastre; documents relating to the introduction and maintenance of the new cadastre; regular periods for reviews of the cadastre; preparation, introduction and maintenance of the urban cadastre.

Exercises (2 hours)

The research needed to made a valuation; collection and analysis of book-keeping figures; compiling cadastral documents; setting valuation rates and taxable incomes; compiling requests for cadastral changes and examples of division of holdings; maintaining cadastral documents; extracts, copies and historical cadastral certificates; visit to the technical department of the Treasury, in particular to see the new property and urban cadastre sections.

CONSTRUCTION AND THE DESIGN OF STRUCTURES

Comments

The purpose of this course is to give a practical view of the building industry by studying each of its aspects aided by organised visits to worksites. Through study of the determination of static forces by graphical methods and strength of materials theory, in as far as they have been adequately prepared for these subjects from the mathematical standpoint, the students should be able to formulate and rationally solve problems concerning the dimensioning of structures, with the help of handbooks.

The teacher ensures that the subject matter taught is at all times closely related to developments in building techniques, and also to surveying practice.

The course is completed with the drafting of dimensioned plans and detailed working drawings and projects including cost estimates and calculation of measurements.

The students are encouraged to use a slide rule. The teacher recapitulates the basic principles and use of building materials, as taught in the natural science and chemistry classes.

Class III (3 hours)

The basics of statics using graphical methods

Graphical representation of forces and the composition and resolution of systems of forces; centre of gravity, static moments and moments of inertia.

The fundamentals of strength of materials theory

Pressures, elastic and permanent deformation; failure loads and safe loads; safety factor; structural members and reactive forces in them, internal stresses, elastic equilibrium and elastic-plastic equilibrium; simple pressures and the more common types of compound pressures; stress verification calculations and project design; the design of beams; basic theory of static stresses in reinforced concrete; prestressed concrete.

Drawing office practice

Working drawings of static forces and strength of materials; detail drawings of buildings; reproduction of plans for small buildings.

Class IV (5 hours)

Site organisation

Perimeter fence, huts, tools and contractors' plant and equipment; standards for the acceptance and use of building materials.

Building structures

Foundations and foundation pits; foundations, brick/block work, piles; the structural frames of buildings; use of reinforced concrete; brick/block work arches; the basics of reinforced brick/block work and concrete arches; wooden, steel, reinforced concrete, reinforced concrete/brick and reinforced brick floors; roofing; stairs and stairways; design of elements and systems enabling stairs to be built; prefabrication in the building industry.

Finishing work

Rough-cast and internal and external surfaces; paints and varnishes; door and window furniture; standardisation and series production.

Internal appointments

Water supply and plumbing; heating and ventilation; electrical installations.

Cost accounting

Determination of unit construction costs; basic costs and cost analysis; listings of unit prices; contracts and general and special specifications.

Drawing office practice

Horizontal and axonometric projection of building structures; flooring and roofing plans; internal layout plans and sketches.

Class V (5 hours)

Housing and civil engineering structures

Medium, low and very low-cost houses; general recommendations for earthquake protection design; low-cost civil engineering projects; agricultural buildings and housing smaller farm buildings (Construction of dwellings for farmers, cowsheds, stables, etc. and buildings for processing, packing and storing agricultural produce).

Road construction

General introduction to roads; the bed and surface of the road; road furniture etc.; civil engineering structures; earth support walls; design and calculation; bridges and footbridges in brick/blockwork, timber, steel and reinforced concrete; calculation of the dimensions of the load bearing members using empirical formulae and tables.

Hydraulic engineering

The fundamentals of practical hydraulics; canals and conduits; use of water in agriculture; small land or drainage schemes; flood protection; bridges, canals and channels; ditches, siphons and abstraction of water for irrigation; introduction to sewerage.

Cost accounting

Quantity and cost estimate calculations; rules for costing, supervising and the acceptance of public works; maintenance of quantity sheets; measurement books, accounting books, progress reports, certificates of account; site registers and manuals for managing and supervising work.

Drawing office practice

Plans for small dwellings and rural buildings, drawn up entirely by the student or from sketches provided; design of civil engineering structures for roads and for smaller hydraulic schemes; the projects are accompanied by explanatory technical reports and quantity and cost estimates; use of the drawing board and desk calculator.

Class IV (2 hours)

Practical exercises in building:

Visits to firms, laboratories and construction sites to bring the students into direct contact with the working environment; through these visits, the students are familiarised with the facilities and methods used in the building industry and in the allied trades; as far as possible, the visits will be arranged so that students can follow the progress of a building project from start to finish (i.e. acceptance). The students write reports describing the visits.

Class V (2 hours)

Regular visits to worksites where public and rural buildings, roads and hydraulic schemes are being built; practical exercises in the laboratory or preferably on the construction site so that the students can acquire the manual practice they will need later to carry out the work of a surveyor appointed to supervise or manage a construction site; write-up of the visits; exercises in measuring dimensions, the progress of the work and the quantities of supplies for the project, if possible as these are being made, with finalisation of the corresponding entries for accounting purposes; practical use of the slide rule; measurements and observations on small construction projects and details of road construction and hydraulic engineering structures.

TOPOGRAPHY AND TOPOGRAPHICAL DRAWING

Comments

This course is of vital importance to the surveyor's profession. A theoretical outline is followed by a series of practical exercises which are completed by graphical representation of the measurements taken. This gives the students adequate practice in using topographical instruments, which are invariably of the most up-to-date type.

The syllabus includes machine-assisted calculations, for solving topographical problems.

Class III (3 hours)

Trigonometry

The purpose of trigonometry; methods of measuring angles and arcs; transposition from one measuring system to another; orthogonal cartesian co-ordinates; definitions and basic properties of trigonometric functions; reduction to the first quadrant; the formulae for adding, subtracting, doubling and bisecting angles; use of natural value and logarithmic tables of trigonometric functions; fundamental relationships between the parts of right angle triangles and other triangles; solution of triangles; calculation of the area of triangles and quadrilaterals.

Topographical drawing

The basics of scales of representation; methods used for topographical drawing; conventional signs used by the Military Geographical Institute and the cadastre.

Class IV (5 hours)

Geometrical optics

Reflection and refraction; mirrors and prisms; introduction to parallel plane mirrors; centred dioptric systems; the simple and compound microscope; the astronomical telescope.

Measurement of distances

Direct and indirect measurement of distances; modern rangefinders;

Measurement of angles

Goniometers and especially modern goniometers; divided circles; methods of interpolating between graduations; theodolites, tachometers; automatic reduction units, surveyors' compasses, simple and graduated set squares; method of measuring horizontal and vertical angles.

Planimetric measurements

The Military Geographical Institute Triangulation; cadastral triangulation; reduction to the station centre; frontal and lateral intersections; Snellius and Hansen

problems; polygonation in general; open and closed polygons; tolerances and correction factors; measurements on small and medium size plots; Cadastral instructions; topographical observation operations for mapmaking: examples of division of holdings.

Measurement of areas

General information; methods for working out areas and exercises on problems; division of areas; rectification of boundaries.

Topographical drawing

Graphical representation of observations taken; reproduction of survey maps on the same or a different scale.

Exercises (3 hours)

Rangefinding and measurement of vertical and horizontal angles; observations taken on small plots; solution of problems using logarithms and natural values of goniometrical functions; use of desk calculators and the slide rule; reading of Military Geographical Institute maps and use of the kilometric grid

Class V (5 hours)

Measuring differences in level

Fundamentals; influence of earth's curvature and refraction; trigonometric, tachometric and barometric levelling; modern optical levels; self-levelling levels.

Levelling

General information; elevation and contour maps; levelling on various types of terrain; measurements on and layout of tunnels; problems on elevation and contour maps.

Odometry

General information; odometric formulae and applications; relationships between stations; field operations and calculations.

Roads

General information; layout and route; preliminary and final project; circular connecting curves; methods of staking out; levelling study of the proposed line; area of occupancy; area of cross-sections; calculation of quantity estimates.

Levelling of ground

Problems encountered, levelling the ground with balanced excavation and back-fill.

The basics of photogrammetry

Fundamental principles; phototheodolites; terrestrial photogrammetry and elementary aerial photogrammetry; photogrammetrical plotting units.

Topographical drawing

Representation of odometrical observations by making an elevation map or plotting a contour; preliminary project for a short-section of road.

Exercises (3 hours)

Checking and adjustment of instruments; measurement of the magnitudes needed to solve levelling and odometric problems; write-ups of the exercises carried out.

APPENDIX 9/I

Summary of the results of An Industrial Survey in the Machine-tool and Electricity Industries

Table 1

Breakdown of technical manpower by category of skill in the firms visited

	Firms visited(1)					
	A1	A2	A3	Total A1+A2+A3	B1	Grand total
I. PERSONE						
Total employees	564	478	207	1,249	3,045	4,294
1. Univ. engineers	7	5	3	15	58	73
2. Technicians of whom:	73	39	22	134	483	617
diploma holders(2)	(23)	(11)	(4)	(38)	(179)	(217)
others	(50)	(28)	(18)	(96)	(304)	(400)
3. Admin. staff(3)	31	33	23	87	870	957
4. Workers(4)	453	401	159	1,013	1,634	2,647
II. PERCENTAGES						
Total employees	100.0	100.0	100.0	100.0	100.0	100.0
1. Univ. engineers	1.2	1.0	1.5	1.2	1.9	1.7
2. Technicians of whom:	13.0	8.2	10.6	10.7	15.9	14.4
diploma holders(2)	(4.1)	(2.3)	(1.9)	(3.0)	(5.9)	(5.1)
others	(8.9)	(5.9)	(8.7)	(7.7)	(10.0)	(9.3)
3. Admin. staff(3)	5.5	6.9	11.1	10.7	28.6	22.2
4. Workers(4)	80.3	83.9	76.8	81.1	53.6	61.7
III. RATIOS						
1. Univ. engineers/ technicians	1/10.5	1/7.8	1/7.3	1/8.9	1/8.3	1/8.5
2. Univ. engineers/ dipl. technicians	1/3.3	1/2.2	1/1.3	1/2.5	1/3.1	1/3.0
3. Technician/workers	1/6.2	1/10.3	1/7.2	1/7.6	1/3.4	1/4.3
4. Dipl. Technicians/ workers	1/19.7	1/36.5	1/39.8	1/26.7	1/9.1	1/12.2

(1) A = Machine tool plants (A1, MINGANTI, Bologna; A2, S.A.I.M.P., Padua; A3, DUPLOMATIC, Busto Arsizio.
B = Power generating and supply plans (SELT-VALDARNO, Florence).

(2) Graduates of Technical Institutes or equivalent.

(3) Including managerial non-technical staff.

(4) Including skilled and semi-skilled.

Table 2

Per cent breakdown of technicians by field of occupation in the machine tool firms visited

Field of occupation	Machine tool firms(1)			
	A1	A2	A3	Total
Design work and projects	37.0	13.0	59.0	31.7
Planning and preparation of work	15.0	30.2	18.2	21.0
Production	27.4	26.4	18.2	25.7
Inspection and control	5.5	7.6	4.5	6.1
Equipment	5.5	-	-	2.7
Sales	4.1	15.2	-	7.4
Purchasing	5.5	7.6	-	5.4
Total	100.0	100.0	100.0	100.0
Number of technicians	73	53	22	148

(1) A = Machine tool plans (A1, MINGANTI, Bologna; A2, S.A.I.M.P., Padua; A3, DUPLOMATIC, Busto Arsizio).

Table 3

Per cent breakdown of technicians by field of occupation in the electricity supply industry

(Societa Elettrica Selt-Valdarno, Florence)

Field of occupation	
Design work and projects	13.7 %
Generation	28.7 %
Transmission	2.8 %
Distribution	54.8 %
	100.0 %

STATISTICAL ANNEX

Table 1

Gross National Product (GNP) in billion Lire(1) (1963-1968)

Year	Current prices at Factor Cost (billion lire)	At constant 1963 prices	
		(billion lire)	Index 1963=100
1963	26,611	26,611	100
1964	29,272	27,314	103
1965	32,593	29,487	111
1966	35,333	31,193	118
1967	38,540	33,230	125
1968	41,437	35,114	132

(1) Monetary unit: Lire. Currency unit per U.S. $ 625.

Table 2

Population and National Income at Current Prices (1951-1965, selected years)

Year	Population (000's)	National Income, bil. lire		Per Capita at Factor Cost	Income, 000's Lire at Market Prices
		at Factor Cost	at Market Prices		
1951	47,418	8,453	9,467	178.3	199.6
1955	48,633	11,708	13,359	240.7	274.7
1960	50,198	16,754	19,219	333.8	382.9
1962	50,942	20,994	24,053	412.1	472.2
1964	52,130	26,576	30,264	509.8	580.5
1965	52,687	28,468	32,398	540.3	614.9

Source: Istituto Centrale di Statistica.

Table 3

Per cent contribution of the productive sectors to GNP

(1951-1968, selected years)

Sector	1951	1961	1963	1965	1968
Primary (Agriculture, forestry and fishing)	25.7	17.6	15.8	15.0	12.6
Secondary	41.3	44.8	46.0	42.8	43.8
Extractive industries			0.9	0.8	0.8
Manufacturing			33.1	30.0	30.9
Electricity, gas, water			3.1	2.9	2.9
Construction			8.9	9.1	9.2
Tertiary	33.0	37.6	38.2	42.2	43.6
Commerce, banking, insurance			17.6	21.0	21.7
Transport and communications			8.1	7.8	8.3
Other services			11.9	13.4	13.6
Total	100.0	100.0	100.0	100.0	100.0

Source: Istituto Centrale di Statistica.

Table 4

Public expenditure on Education (1954-1967, selected years)

Year	in billion lire	Expenditure as % of total Gov. Exp.	Expenditure as % of Net National Income
1954/55	299.9	11.4	1.8
1958/59	475.2	14.1	2.8
1960/61	657.0	14.4	3.2
1961/62	750.7	15.7	3.3
1962/63	980.2	17.2	3.8
1963/64	1,178.2	18.5	4.1
1965	1,534.0	18.1	4.7
1966	1,674.0	17.7	4.8
1967	2,277.4	19.6	5.7

Source: (a) OECD, Reviews of National Educational Policies, Italy, Paris, 1969.

(b) Ministry of Education, l'Istruzione pubblica in Italia, Rome, 1968.

Table 5

Public expenditure on education - Per Capita and per pupil/student (1962, 1967)

	In Lire		Index 1962=100
	1962	1967	
1. Expenditure on education and culture			
- per inhabitant	23,257	42,717	184
- per pupil (in public or private schools)	166,606	249,470	150
2. Expenditure of the Ministry of Education			
- pupil in elementary school	77,659	123,392	159
- pupil in middle school	110,314	211,374	192
- pupil in upper secondary school	171,428	236,399	156
- student in university	273,009	391,994	144

Source: Ministry of Education, l'Istruzione Pubblica in Italia, Roma, 1968.

Table 6

Foreign Trade (1963/64, 1967/68)

Exports	1963/64	1967/68
1. Exports of goods and services as a percentage of GNP	12(1)	18
2. Main exports (percentage of total exports)		
- Machinery	23	39
- Fabrics and textile goods	15	12
- Chemical products	14	14
- Foodstuffs	13	10
- Motor vehicles	7	8
Imports		
1. Imports of goods and services as a percentage of GNP	16(1)	16
2. Main imports (percentage of total imports)		
- Metals, ores and scrap	13	13
- Crude oil	10	14
- Foodstuffs	21	21
- Machinery	20	19
- Chemical products	8	9

(1) Average 1961-63.

Source: OECD, Economic Surveys, Italy, Paris 1965 and 1969.

Table 7

Value of imports/exports (1961, 1968)

	Million Lire			
	1961		1968	
	Imports	Exports	Imports	Exports
1. Agricultural products	745,718	267,128	1,143,715	337,404
2. Extractive industries	597,916	20,260	1,303,927	23,265
3. Manufacturing industries	1,920,390	2,329,958	3,960,238	6,003,851
Total	3,264,024	2,617,346	6,407,880	6,364,520
% of imports covered by exports	80.4	-	99.4	-

Table 8

Living Standards

	1963	1967
1. Meat consumption, kg. per year, per head.	31.4	39
2. Gross average hourly wage of industrial workers (lire)	344	616(1)
3. Energy production, kwh, per year, per head.	-	2,827
4. No. of cars per 1,000 inhabitants.	75	136
5. No. of T.V. sets per 1,000 inhabitants.	86	144
6. No. of telephone sets per 1,000 inhabitants.	-	132

(1) In 1968.

Source: OECD, Economic Surveys, Italy, Paris 1965 and 1969.

Table 9

Active population by sex and economic sectors

(1951, 1961)

Economic sector	1951				1961			
	Male 000's	Female 000's	Total 000's	Total %	Male 000's	Female 000's	Total 000's	Total %
Primary	6,228	2,033	8,261	17.4	4,194	1,499	5,693	11.3
agriculture, forestry and fishing								
Secondary	4,913	1,377	6,290	13.2	6,442	1,521	7,963	15.7
extractive and manufacturing industry	3,360	1,361	4,721	9.9	4,008	1,491	5,499	10.9
electricity, gas, water	92	5	97	0.2	111	7	118	0.2
construction	1,461	11	1,472	3.1	2,323	23	2,346	4.6
Tertiary	3,523	1,503	5,026	10.6	4,092	1,824	5,936	11.7
commerce, banking, insurance	1,366	463	1,829	3.9	1,599	642	2,241	4.4
transport and communications	731	54	785	1.6	895	72	967	1.9
public administration	1,128	542	1,670	3.5	947	405	1,352	2.7
other services	298	444	742	1.6	651	725	1,376	2.7
Unemployed(1)	737	357	1,094	2.3	417	164	581	1.1
Total, active population	15,401	5,270	20,671	43.5	15,145	5,028	20,173	39.8
Non active population	7,858	18,986	26,844	56.5	9,639	20,812	30,451	60.2
10 years old or less	4,200	4,006	8,206	17.3	4,163	3,993	8,176	16.2
over 10 years of whom:	3,658	14,980	18,638	39.2	5,455	16,819	22,274	44.0
pupils and students	1,978	1,329	3,307	7.0	2,574	1,851	4,425	8.7
housewives	-	12,517	12,517	26.3	-	12,697	12,697	25.1
on pension	828	424	1,252	2.6	1,982	1,484	3,466	6.9
others	852	710	1,562	3.3	899	787	1,686	3.3
Total population	23,259	24,256	47,515	100.0	24,784	25,840	50,624	100.0

(1) In search of work for the first time.

Source: Annuario Statistico Italiano, 1969.

Table 10

Enrolments by age group, Primary, Middle and Upper Secondary Schools (1952/53, 1959/60, 1964/65)

Age Groups Years	Per cent of the age group concerned			
	Total	Primary	Middle Sec.	Upper Sec.
1952/53				
7 - 14	78.7	68.6	10.1	-
7 - 11	95.5	94.6	0.9	-
11 - 14	53.2	29.2	24.0	-
15	16.9	3.4	13.5	-
over 15	10.5	-	10.5	-
1959/60				
7 - 14	85.0	66.8	17.8	0.4
7 - 11	96.8	95.7	1.1	-
11 - 14	67.1	22.4	43.7	1.0
14 - 19	21.0	0.3	6.1	14.6
20 - 21	7.6	-	0.4	7.2
over 21	4.0	-	-	4.0
1964/65				
up to 6	2.0	2.0	-	-
7 - 14	91.5	68.2	22.8	0.5
7 - 11	97.2	96.1	1.1	-
11 - 14	81.6	19.7	60.6	-
14 - 19	27.3	0.1	5.9	21.3
over 19	9.2	-	0.2	9.0

Source: OECD, Reviews of National Educational Policies, Italy. Paris 1969.

Table 11

Number of pupils per teacher in State schools
by level and type of education (1961/62, 1964/65)

Level and type of education	1961/62	1964/65	1966/67
1. Primary schools	22.0	22.0	21.8
2. Lower Secondary schools	12.3	12.0	12.2
3. Upper Secondary schools	11.5	13.0	14.7
classical	12.3	14.9	15.1
science	11.8	13.7	14.8
teacher training	10.7	13.9	14.2
4. Technical Institutes	13.2	13.9	14.2
commerce and surveying	12.8	13.6	13.8
industrial	15.3	15.3	15.2
agricultural	9.3	9.8	10.8
nautical	10.6	10.0	11.0
women's occupations	11.5	11.0	8.6
tourism	-	10.2	9.7
5. Vocational Institutes	8.9	10.6	10.1
6. Art Schools and Institutes	5.4	9.3	6.9
7. Teacher training institutions (post secondary)	8.7	10.3	10.4

Source: (a) OECD, Reviews of National Educational Policies, Italy, Paris 1969.

(b) Ministry of Education, l'Istruzione Pubblica in Italia, Rome, 1968.

Table 12

Standard of education of the active population by sector of economic activity (1960, 1966)

Standard of education	1960 Agriculture	1960 Industry	1960 Services	1960 Total	1966 Agriculture	1966 Industry	1966 Services	1966 Total
In 000's								
1. University degree	6	54	401	461	5	59	460	524
2. Secondary school certificate	15	190	826	1,031	19	267	899	1,185
3. Middle school certificate	69	714	1,097	1,088	82	1,082	1,358	2,522
4. Primary school certificate	2,601	4,735	2,901	10,237	2,481	5,213	3,085	10,779
5. No school certificate	2,768	1,701	838	5,307	1,826	935	582	3,343
6. Illiterate	756	135	99	990	349	82	65	496
Total	6,215	7,529	6,162	19,906	4,762	7,638	6,449	18,849
In percentages								
1. University degree	0.1	0.7	6.5	2.3	0.1	0.8	7.1	2.8
2. Secondary school certificate	0.2	2.5	13.4	5.2	0.4	3.5	14.0	6.3
3. Middle school certificate	1.1	9.5	17.8	9.4	1.7	14.1	21.1	13.4
4. Primary school certificate	41.9	62.9	47.1	51.5	52.1	68.3	47.8	57.2
5. No school certificate	44.5	22.6	13.6	26.7	38.4	12.2	9.0	17.7
6. Illiterate	12.2	1.8	1.6	4.9	7.3	1.1	1.0	2.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: OECD, Review of National Educational Policies, Italy, Paris 1969.

Table 13

Trend in educational level

Number of people holding a primary school leaving certificate					
Year	000's	%	Year	000's	%
1901	10,286	41.6	1936	23,290	68.1
1911	13,516	51.0	1951	28,985	74.4
1921	18,419	61.0	1961	33,967	81.5
1931	21,208	66.0			

Table 14

Standard of education of the population over six years old (1951, 1961)

Standard of education	1951		1961		Index 1951=100
	000's	%	000's	%	
1. University degree	429	1.0	603	1.3	137.8
2. Secondary school leaving certificate	1,372	3.3	1,939	4.2	140.7
3. Middle school certificate	2,515	6.0	4,375	9.6	173.6
4. Primary school certificate	24,947	58.9	27,588	60.6	111.1
5. No school certificate	7,582	17.9	7,314	16.0	96.5
6. Illiterate	5,456	12.9	3,797	8.3	69.7
	42,301	100.0	45,616	100.0	108.0

Source: Istituto Centrale di Statistica.

Table 15

Estimated number leaving school and entering employment in 1961 (in 000's)

Level and type of school education	Leave school		Enter employment as					
	with diploma	without diploma	unskilled workers	semi-skilled workers	skilled workers	middle management lower	middle management upper	top management & other senior executives
Primary	80.0	-	80.0	-	-	-	-	-
Lower Secondary	-	595.0	595.0	-	-	-	-	-
Upper Secondary								
(i) vocational institutes	33.0	9.0	9.0	-	33.0	-	-	-
(ii) technical institutes	45.0 -	- 28.0	- -	- -	- -	18.0 28.0	27.0 -	- -
(iii) lycées and teacher training colleges	16.0 -	- 33.0	- -	- -	- -	6.0 33.0	10.0 -	- -
Higher Education								
(i) diplomas	1.1	1.4	-	-	-	-	1.4	1.1
(ii) degrees	22.0	35.5	-	-	-	-	35.5	22.0
Total	197.1	701.9	684.0	-	33.0	85.0	73.9	23.1

Source: OECD, The Mediterranean Regional Project, Italy, Paris, 1965.

Table 16

Estimated numbers leaving school and entering employment in 1975 on the basis of the targets adopted in the MRP report (in 000's)

Level and type of education	will leave school		will enter employment as					
	with diploma	without diploma	unskilled workers	semi-skilled workers	skilled workers	middle management lower	middle management higher	top management & other senior executives
Primary	20.0	-	20.0	-	-	-	-	-
Lower Secondary	-	170.0	170.0	-	-	-	-	-
Upper Secondary								
(i) Vocational institutes	310.0	40.0	25.0	125.0	115.0	85.0	-	-
(ii) Technical institutes	137.6 -	- 40.0	- -	- -	- -	57.3 40.0	80.3 -	- -
(iii) Lycées	32.4 -	- 25.0	- -	- -	- -	12.4 25.0	20.0 -	- -
Higher Education								
(i) Diplomas	15.0	5.0	-	-	-	-	5.0	15.0
(ii) Degrees	45.0	10.0	-	-	-	-	10.0	45.0
Total	56.0	290.0	215.0	125.0	115.0	219.7	115.3	60.0

Source: OECD, The Mediterranean Regional Project, Italy, Paris 1965.

Table 17

Occupational breakdown by sector in 1975
Empirical/practical estimates based on MTP targets

Occupational category	Percentages		
	Agriculture	Industry	Services
1. Top management and other senior executives	0.5	4.6	11.7
2. Middle management	1.5	24.4	41.5
Technicians	1.5	11.4	12.7
Supervisors	-	7.5	22.9
Foremen	-	5.5	4.3
3. Production Staff	98.0	71.0	46.8
Skilled workers	75.0	59.2	31.6
Unskilled workers	23.0	11.8	15.2

Source: OECD, Mediterranean Regional Report, Italy, Paris 1965.

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