

INTERNATIONAL TRAINING
CENTRE
OF
EARTHQUAKE ENGINEERING

July 1960—March 1961

HOST INSTITUTE: EARTHQUAKE RESEARCH INSTITUTE,
UNIVERSITY OF TOKYO

INTERNATIONAL TRAINING CENTRE OF EARTHQUAKE ENGINEERING

From July 1, 1960 till March 24, 1961

Seismology is a branch of science to study earthquakes which at times menace human lives in many countries situated in the seismic zones of the world. In most of the countries in the well-known seismic zones such as Canada, Chile, Colombia, Greece, India, Indonesia, Iran, Italy, Japan, Mexico, New Zealand, Pakistan, the Philippines, Turkey, the United States of America, etc., the necessity of mitigating and preventing earthquake damage has been keenly felt, and earnest endeavours have been made for this purpose.

Earthquake engineering aims to study the influences of earthquakes on buildings, dams, bridges, harbour works, etc. and to find means of rational and economical design and construction of earthquake-proof structures. It is therefore closely related with industry and all phases of our life. We believe that progress in this field of science contributes directly to the welfare of mankind.

In Japan, the big earthquake of 1923, which devastated the Tokyo and Yokohama areas, gave a strong impetus to the studies on seismology and earthquake engineering with the result that new fields were opened by many scientists and engineers. Also, the necessity of cooperation of seismologists and structural engineers throughout the world and interchange of their knowledge has been widely recognized. Exchange of scholars and students between Japan and other countries concerned has increased so much in number that it is now felt better to have a special training centre for seismology and earthquake engineering, because fuller education and cooperation could be carried out there according to a well-arranged and comprehensive curriculum.

The Government of Japan has thus decided to open a centre at its own expense from the fiscal year of 1960, inviting trainees from

foreign countries. The activities of this training centre will be continued as far as circumstances permit.

At present, a nine-month course of training is scheduled; four months for the training of general courses and five months for the training of the special course (advanced seismology or earthquake engineering). The language used in the training is English.

The living expenses during the training period, the travel expenses from the trainee's country to Japan and from Japan back to trainee's country and travel expenses for the excursions planned in the training courses will be given to the trainee by the Government of Japan. Training fee is free.

The Host Institute of this Training Centre is as follows:

Earthquake Research Institute, University of Tokyo, Japan.
Address: No. 1, Motofuji-cho, Bunkyo-ku, Tokyo, Japan.

EDUCATIONAL QUALIFICATIONS OF TRAINEE

The minimum educational qualification of an applicant of this training is that he should be a *university or a college graduate or an equivalent*.

ADMISSION AND SELECTION OF COURSE

1. Admission to the training is a prerequisite to registration.
2. Trainees are requested to state the branch of the Special Course they choose.
3. Registration and selection of the Special Course should be made before the commencement of the training.
4. All trainees must receive the training of General Courses (I) and (II), thereafter they receive the training of the selected branch of Special Course.
5. Special Course consists of two branches; Advanced Seismology and Earthquake Engineering.
6. After the start of training of the General and the Special Courses, the trainee may change his Special Courses on the approval of the Chairman of the Training Committee. No trainee may change his

Special Course after four weeks of the training of the Special Course.

7. An auditor may be allowed to participate in the training courses when he gets the Chairman's approval.

CERTIFICATE

Certificate is issued by the Training Committee to the trainee who gives satisfactory results of the training.

OFFICE OF THE TRAINING CENTRE

Office: (Host Institute)

Earthquake Research Institute, University of Tokyo
Address: No. 1, Motofuji-cho, Bunkyo-ku, Tokyo, Japan
All communications relating to the Training Centre of the Earthquake Engineering should be addressed to the *Director of the Earthquake Research Institute, University of Tokyo*.
Telephone: 921-3151—(Extension) 2182
Cable address (Abbreviated): ZISINKEN, TOKYO

Branch Office:

International Training Centre of Earthquake Engineering
c/o Institute of Industrial Science, University of Tokyo
No. 13, Shin-ryudo-cho Minato-ku, Tokyo
Telephone: 408-3910.

TRAINING CALENDAR

(Seismology and Earthquake Engineering)

1960

July 1, Friday Training commencement.
July 6, Wednesday Opening Ceremony.
July 7, Thursday General course begins.
From July 11, Monday to July 18, Monday ... Attend the Second World Conference on Earthquake Engineering held at Tokyo and Kyoto.
September 1, Thursday Anniversary of the Kwantō earthquake of 1923.

October 28, FridayGeneral course ends.
 October 31, MondaySpecial course begins.
 December 21, WednesdayChristmas and New Year
 recess begins.

1961

January 9, MondayChristmas and New Year
 recess ends, training resumes.
 March 24, FridaySpecial course ends, gradua-
 tion ceremony

* National holidays: September 23, Friday; November 3, Thursday; Novem-
 ber 23, Wednesday; March 21, Tuesday.

- (1) Training is made on five days a week (from Monday to Friday).
 Saturday is set aside for self-study.
- (2) Lectures are made in the mornings; Laboratory and field exercises,
 and excursions to near places are made in the afternoons of appro-
 priate days. Excursions to Nagoya and Kansai districts will be made
 in November.

CURRICULUM OF EARTHQUAKE ENGINEERING TRAINING CENTRE

GENERAL COURSE—(I): SeismologyThree months
 Lecture; 102 hours

<i>Subject</i>	<i>hours</i>	<i>lecturer</i>
General seismology	6	Y. Sato
Theory of seismic waves	8	R. Yoshiyama
Seismometry and observation technics. 20		U. Inouye, T. Hirano T. Usami, T. Utsu, T. Miura, N. Ya- makawa
Seismicity	10	H. Kawasumi
Seismic damage	8	N. Nasu
Vibration characteristics of ground ..	8	K. Kanai
Macro-seismic phenomena	4	F. Kishinouye
Theory of seismographs	6	T. Hagiwara
Crustal deformations	4	T. Hagiwara
Tsunami	8	R. Takahasi
Seismic prospecting	4	S. Omote
Volcanology	6	T. Minakami
Geology	8	H. Tsuya

Exercises and laboratory practices; (Afternoon, 51 days)

Excursion

Earthquake Research Institute
 Asama Volcano Observatory of ERI
 Tsukuba Branch Station of ERI

GENERAL COURSE—(II): Soil MechanicsOne month

Lecture; 44 hours

<i>Subject</i>	<i>hours</i>	<i>lecturer</i>
General lectures		
Introduction to soil mechanics	3	Y. Ohsaki
Properties of soil against water	4	M. Saito
Consolidation of soil	2	J. K. Minami
Shearing strength	4	K. Hoshino
Earth pressure	4	T. Mogami
Pressure in the ground	1	Y. Ohsaki
Stability of slope	2	Y. Ohsaki
Bearing capacity	2	J. K. Minami
Supporting power of pile	2	J. K. Minami
Total 24 hrs.		

Special lectures

Dynamical properties of soil	2	T. Mogami
Soft ground improvement procedures..	2	Y. Ishii
Earth dams, land slide	2	M. Fukuoka
Soil mechanics relating to road con- struction	2	K. Hoshino
Building foundations	2	Y. Yoshimi
Total 10 hrs.		

Exercises 10

Total 10 hrs.

Laboratory practices; 36 hours

Soil test.....Afternoon, 12 days..

Instructor: K. Kotoda, Y. Koizumi, G. Miki, A. Mori, T. Watanabe

Site exploration.....Afternoon, 4 days

Instructor: H. Mori

SPECIAL COURSE—(I): Advanced Seismology..... Five months

Lecture; 160 hours

<i>Subject</i>	<i>hours</i>	<i>lecturer</i>
Theoretical seismology	16	R. Yoshiyama
Seismometry	32	T. Hirano, U. Inouye
Field seismology	16	F. Kishinouye
Seismological instruments, I	12	T. Hagiwara
Seismological instruments, II	20	N. Nasu
Theory of vibrations	20	H. Kawasumi

Special lectures:

Surveying	8	R. Takahasi
Volcanology, I	4	T. Minakami
Volcanology, II	6	R. Morimoto
Structure of the earth, I	6	S. Omote
Structure of the earth, II	4	T. A. Santo
Gravity	4	K. Aki
Geology and petrology	8	H. Tsuya,
		R. Morimoto
Geomagnetism	4	S. Ueda

SPECIAL COURSE—(II): Earthquake Engineering Five months

A. Earthquake Engineering on Building Structures. (9 weeks)

Subject	hours		lecturer
	lecture	Exercise or field work	
1. Earthquake damage	8	0	T. Naito H. Umemura
2. Earthquake resistant construction			
i) Building materials.....	2	2	M. Hamada
ii) Timber construction.....	2	2	T. Hisada
iii) Masonry construction	2	2	K. Matsushita
iv) Steel construction.....	2	2	T. Naka
v) Composite construction	2	2	T. Naka
vi) Reinforced concrete construction	2	2	H. Umemura
vii) Building foundation	2	2	J. K. Minami
viii) Building Codes and Regulations..	2	2	K. Takeyama
3. Structural dynamics and statics	6	20	K. Muto H. Umemura Y. Osawa
4. Structural design.....	6	20	T. Hisada H. Umemura M. Izumi Y. Osawa
5. Special lectures.....	10	0	T. Naito, S. Ban R. Tanabashi
6. Laboratory works..... (Structure test and vibration test)	0	30	Univ. of Tokyo (Umemura) Earthquake Research. Institute (Kanai) Building Research Institute (Naka- gawa) Waseda Univ. (Takeuchi) Tokyo Institute of Technology (Kobayashi)
7. Excursions (Tokyo area) 2 weeks (1 day×10 places)			Institute of Industrial Science (Tsuboi)

B. Earthquake Engineering on Civil Engineering Constructions. (7 weeks)

1. Earthquake damage and earthquake resistant design.

Subject	hours		lecturer
	lecture	exercise	
i) Bridge structures.....	14	9	T. Takada Y. Tada
ii) Harbor constructions	14	9	Y. Ishii (uncertain)
iii) Dams	14	9	T. Hatano
iv) Water supply and sewerage....	14	9	K. Horie Y. Nakagawa

2. Vibration theory of civil engineering structures

S. Okamoto
K. Kubo

3. Special lectures

A. Hirai (uncertain)
K. Tomonaga
M. Numata

4. Laboratory works

i) At University of Tokyo.....	A. Hirai, M. Ito
ii) At Institute of Industrial Science	S. Okamoto, K. Kubo
iii) At Public Work Research Institute	Y. Mura, T. Takada
iv) At Transportation Technical Research Institute	Y. Ishii, S. Ichihara

5. Excursions (Tokyo area)
15 places

NOTE: A certain number of other lecturers will take part in the training.

LIST OF TRAINERS (LECTURERS)

Aki, K., Dr. Sc.	Assistant, University of Tokyo
Fukuoka, M. B. Eng.	Technical Official, Public Works Research In- stitute, Ministry of Construction
Hagiwara, T., Dr. Sc.	Professor, University of Tokyo
Hatano, T., Dr. Eng.	Expert, Central Research Institute of Electric Power Industry
Hirai, A., Dr. Eng.	Professor, University of Tokyo
Hirono, T., Dr. Sc.	Technical Official, Japan Meteorological Agen- cy, Ministry of Transportation
Hisada, T., Dr. Eng.	Technical Official, Building Research Institute, Ministry of Construction
Horie, K., Dr. Eng.	Consultant, Japan Water Works Consulting Co.
Hoshino, K., Dr. Eng.	Professor, University of Tokyo
Ichihara, S., Dr. Eng.	Technical Official, Building Research Institute, Ministry of Construction
Inouye, U., Dr. Sc.	Technical Official, Japan Meteorological Agen- cy, Ministry of Transportation
Ishii, Y., Dr. Eng.	Technical Official, Transportation Technical Research Institute, Ministry of Transporta- tion

Ito, M., Dr. Eng.
Izumi, M., Dr. Eng.

Kanai, K., Dr. Eng.
Kawasumi, H., Dr. Sc.
Kishinouye, F., Dr. Sc.
Koizumi, Y., B. Eng.

Kotoda, K., B. Eng.
Kubo, K., B. Eng.
Matsuo, H., Dr. Eng.
Matsushita, K., Dr. Eng.
Miki, G., Dr. Eng.
Minakami, T., Dr. Sc.
Minami, J. K., Dr. Eng.
Miura T.,
Mogami, T., Dr. Eng.
Mori, A., B. Eng.
Mori, H.,
Morimoto, R., B. Sc.
Mura, Y., B. Eng.

Muto, K., Dr. Eng.
Naito, T., Dr. Eng.
Naka, T., Dr. Eng.
Nakagawa, K., B. Eng.

Nakagawa, Y., B. Eng.

Nasu, N., Dr. Sc.
Numata, M., B. Eng.
Ohsaki, Y., Dr. Eng.

Okamoto, S., Dr. Eng.
Omote, S., Dr. Sc.
Osawa, Y., Dr. Eng.
Saito, M.,

Santo, T. A., B. Sc.
Sato, Y., Dr. Sc.
Tada, Y., B. Eng.

Takada, T., Dr. Eng.

Takahasi R., Dr. Sc.
Takeyama, K., Dr. Eng.

Takeuchi, M., Dr. Eng.
Tomonaga, K., Dr. Eng.
Tsuya, H., Dr. Sc.
Ueda, S., Dr. Sc.
Umemura, H., Dr. Eng.
Usami, T., Dr. Sc.
Utsu, T., B. Sc.
Yamakawa, N., B. Sc.
Yoshimi, Y., Ph. D.
Yoshiyama, R., Dr. Sc.
Watanabe, T.,

Assistant Professor, University of Tokyo
Building Research Institute, Ministry of Construction
Technical Official, Tokyo University
Professor, University of Tokyo
Professor, University of Tokyo
Building Research Institute, Ministry of Construction
Assistant Professor, Waseda University
Assistant Professor, University of Tokyo
Professor, University of Kyushu
Professor, University of Tokyo
Assistant Professor, University of Tokyo
Professor, University of Tokyo
Professor, Waseda University
Technical Official, Japan Meteorological Agency
Professor, University of Tokyo
Assistant Professor, Waseda University
Survey Company of Soil and Foundation
Assistant Professor, University of Tokyo
Technical Official, Public Works Research Institute, Ministry of Construction
Professor, University of Tokyo
Professor Emeritus, Waseda University
Professor, University of Tokyo
Technical Official, Building Research Institute, Ministry of Construction
Water Work and Sewerage Bureau, Tokyo Metropolitan Government
Professor, Waseda University
Professor, Waseda University
Technical Official, Building Research Institute, Ministry of Construction
Professor, University of Tokyo
Assistant Professor, University of Tokyo
Assistant, University of Tokyo
Chief, Soil Mechanics Branch, Railway Technical Research Institute, National Railway
Assistant, University of Tokyo
Assistant Professor, University of Tokyo
Technical Official, Public Works Research Institute, Ministry of Construction
Technical Officer, Public Works Research Institute, Ministry of Construction
Professor, University of Tokyo
Director, Building Research Institute, Ministry of Construction
Professor, Waseda University
Technical Official, National Bureau of Railway
Professor, University of Tokyo
Assistant, University of Tokyo
Assistant Professor, University of Tokyo
Technical Official, Japan Meteorological Agency
Technical Official, Japan Meteorological Agency
Technical Official, Japan Meteorological Agency
Yamashita Design Bureau K.K.
Professor, University of Tokyo
Assistant Professor, University of Tokyo

Detailed Program of General Course

Schedule for the Period from July to October

Events	Date	Lecturer				
		Monday	Tuesday	Wednesday	Thursday	Friday
Orientation	July 1- 5					
Opening Ceremony	July 6					
Lecture	July 7- 8				Excur. 1	Sato
World Conference on Earthq. Eng.	July 11-18	Attend the Conference, no lectures.				
Lecture	July 21, 22				Sato	Sato
Lecture	July 25-29	Kanai	Usami	Yoshiyama	Kawasumi	Yoshiyama
Lecture	Aug. 1- 5	Kanai	Usami	Yoshiyama	Kawasumi	Yoshiyama
Lecture	Aug. 8-12	Excur. 2	Usami	Kanai	Kawasumi	Nasu
Lecture	Aug. 15-19	Omote	Yamakawa	Kanai	Kawasumi	Nasu
Lecture	Aug. 22-26	Excur. 3	Utsu	Omote	Kawasumi	Nasu
Lecture	Aug. 29- 2	Hagiwara	Utsu	Kishinouye	Sept. 1	Nasu
Lecture	Sept. 5- 9	Hagiwara	Utsu	Takahasi	Kishinouye	Tsuya
Lecture	Sept. 12-16	Hagiwara	Miura	Takahasi	Minakami	Tsuya
Lecture	Sept. 19-23	Hagiwara	Inouye	Takahasi	Minakami	Tsuya
Lecture	Sept. 26-30	Hagiwara	Hirono	Takahasi	Minakami	Tsuya
Lecture	Oct. 3- 7	Ohsaki	Saito	Minami	Hoshino	Mogami
Lecture	Oct. 10-14	Ohsaki	Saito	Minami	Hoshino	Mogami
Lecture	Oct. 17-21	Ohsaki	Saito	Minami	Hoshino	Mogami
Lecture	Oct. 24-28	Ohsaki	Spec. lect.	Minami	Spec. lect.	Spec. lect.

Excur. 1; Earthquake Research Institute

Excur. 2; Tsukuba Branch Station of ERI

Excur. 3; Asama Volcano Observatory of ERI

GENERAL COURSE—(I): Seismology.....Three months

Lecture; (102 hours)

Subject	hours	lecturer
General seismology	6	Y. Sato
Theory of seismic waves	8	R. Yoshiyama
Seismicity	10	H. Kawasumi
Seismic damage	8	N. Nasu
Vibration characteristics of ground.....	8	K. Kanai
Macro-seismic phenomena	4	F. Kishinouye
Theory of seismographs	6	T. Hagiwara
Crustal deformations	4	T. Hagiwara
Tsunami.....	8	R. Takahasi
Seismic prospecting	4	S. Omote
Volcanology	6	T. Minakami

Geology	8	H. Tsuya
Seismometry and observation technics		members of J.M.A.
Determination of hypocentre and construction of travel-time curves	6	T. Usami
Amplitude period, energy of seismic waves	2	N. Yamakawa
Reading of seismograms and determinations of magnitude M.....	6	T. Utsu
Invitation of J.M.A.	2	T. Miura
Seismicity	2	U. Inouye
Introduction of the routine works and system of J.M.A.	2	T. Hirono
Laboratory practices and excursions; (Afternoon, 51 days)		
Excursions		
Earthquake Research Institute		
Tsukuba Branch Station of ERI		
Asama Volcano Observatory of ERI		

GENERAL COURSE—(II): Soil MechanicsOne month

Lectures; 44 hours

<i>Subject</i>	<i>hours</i>	<i>lecturer</i>
General lectures		
Introduction to soil mechanics.....	3	Y. Ohsaki
Properties of soil against water	4	M. Saito
Consolidation of soil.....	2	J. K. Minami
Shearing strength.....	4	K. Hoshino
Earth pressure	4	T. Mogami
Pressure in the ground	1	Y. Ohsaki
Stability of slope	2	Y. Ohsaki
Bearing capacity	2	J. K. Minami
Supporting power of pile	2	J. K. Minami
Total 24 hrs.		

Special lectures

Dynamical properties of soil.....	2	T. Mogami
Soft ground improvement procedures	2	Y. Ishii
Earth dams, land slide	2	M. Fukuoka
Soil mechanics relating to road construction.....	2	K. Hoshino
Building foundations.....	2	Y. Yoshimi

Total 10 hrs.

Exercises 10

Total 10 hrs.

Laboratory practices; 36 hours

Soil test.....	Afternoon, 12 days
Instructor: K. Kotoda, Y. Koizumi, G. Miki A. Mori, T. Watanabe	
Site exploration	Afternoon, 4 days
Instructor: H. Mori	

Y. Ohsaki

October 3; Introduction to soil mechanics 1

1. Introduction (soil mechanics, nature of soils, formation of soils)
2. Fundamental relations (phase diagram, fundamental matters—unit weight, specific gravity, etc.—, interrelationship between fundamental matters)
3. Properties of soil grains (grain shape, grain size)

October 10; Introduction to soil mechanics 2

4. Properties of soils (grain structures, consistency)
5. Identification and classification of soils

Pressure in the Ground

Boussinesq formula etc.

October 17

Stability of slope,

1. General behaviour of slope failure
2. Critical height of slope
3. Driving moment and resisting moment, factor of safety
4. Toe, base and slope failures
5. Stability computations by method of circular surface of sliding

October 24; Exercise

M. Saito

October 4

1. Soil moisture (varieties of soil moisture, effects of moisture on soil skeleton)
2. Capillarity (surface tension, capillary rise, capillary pressure)
3. Permeability (Darcy's law, coefficient of permeability, seepage force, critical hydraulic gradient, heaving, boiling and internal erosion, protection filter)

October 11

4. Seepage (flow net, flow net construction, rate of percolation, scale transformation, seepage through earth dams)
5. Drainage (purpose and types of drainage, theory of the well, wellpoints, electro-osmosis, desiccation)
6. Frost action

October 18; Exercise

J. K. Minami

October 5

1. Consolidation of clay layers, (mechanism of consolidation, theory of one-dimensional consolidation, simple applications), compressibility of soil

October 12

2. The bearing capacity of soils (a description of prevalent methods for estimating the bearing power of soils such as soil load tests, Terzaghi's approximate method with discussion of the various

aspects concerning soil bearing capacity.)

October 19

3. The supporting power of piles (dynamic pile formulas, pile load tests, statical or theoretical pile formulas with discussion of the various aspects concerned.)

October 26; Exercise

K. Hoshino

October 6

1. Coulomb's law
2. Conditions of failure of soil
3. Shear strength of soils
4. Compressive strength, sensitivity of soils

October 13

5. Measurement of shearing strength
6. Deformation and failure under shear

October 20; Exercise

T. Mogami

October 7

1. Conception of earth pressure
2. Coulomb's earth pressure
3. Rankine's earth pressure

October 14

4. Earth pressure at rest
5. Earth pressure distribution

October 30; Exercise

Special lectures

- Oct. 14 (Afternoon) Y. Ishii; Soft ground improvement procedures
Oct. 21 (Afternoon) T. Mogami; Dynamical properties of soil
Oct. 25 K. Hoshino; Soil mechanics related to road construction
Oct. 27 M. Fukuoka; Earth dams, land slide
Oct. 28 Y. Yoshimi; Building foundations