UNIVERSITI KEBANGSAAN MALAYSIA
The National University of Malaysia

NARATIF BAHARU UKM
UNIVERSITI WATAN KITA

INSTITUT PERUBAHAN IKLIM
Institute of Climate Change

POSTGRADUATE PROGRAMME GUIDE BOOK

INSTITUT PERUBAHAN IKLIM (IPI)

INSTITUTE OF CLIMATE CHANGE

UNIVERSITI KEBANGSAAN MALAYSIA

2022
2023

www.ukm.my/ipi

ipiukm

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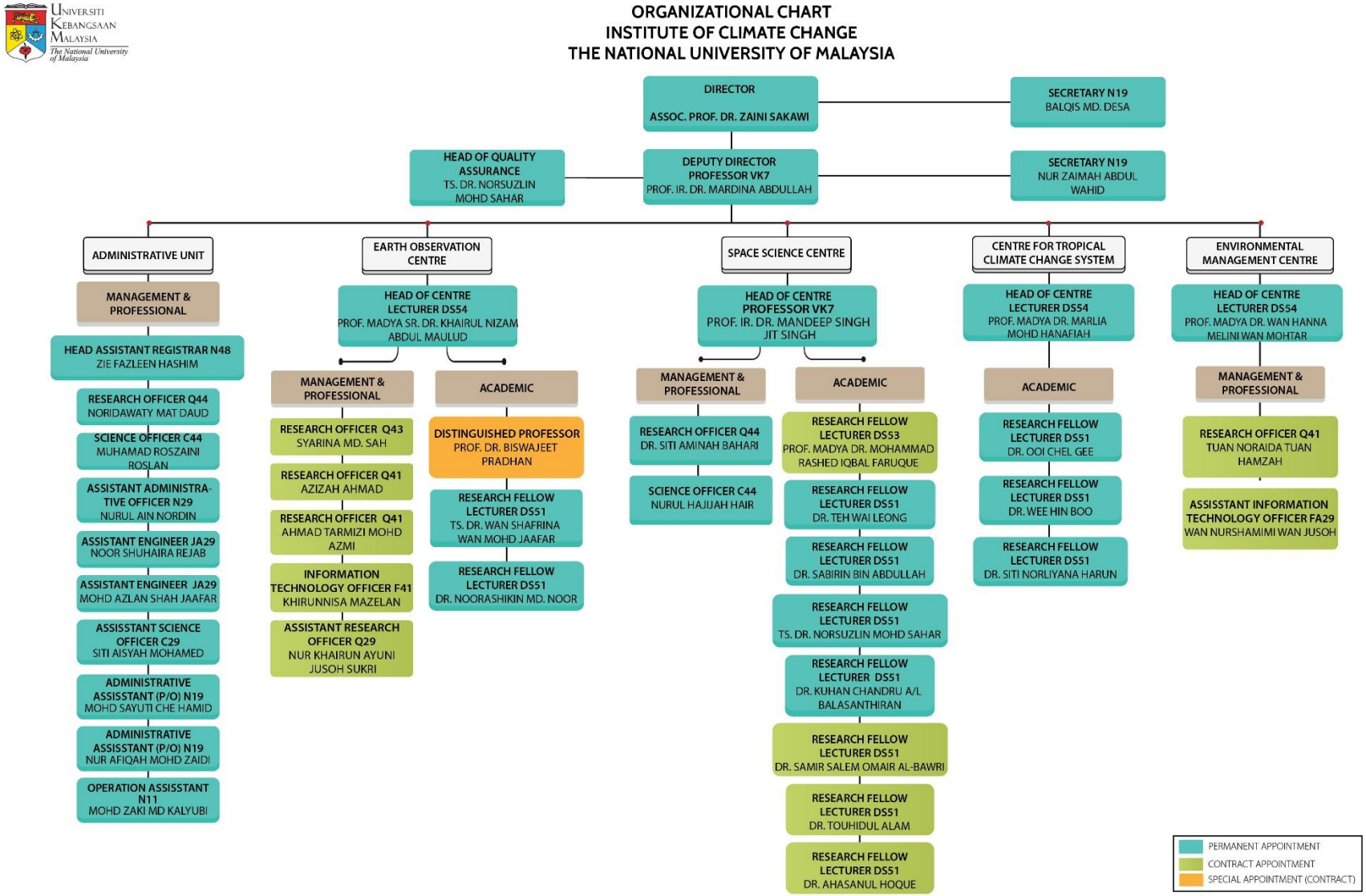
Welcome to the Institute of Climate Change (IPI), Universiti Kebangsaan Malaysia. At IPI, we are committed in providing a holistic graduate experience along with scientific research as its core. Our laboratories and student study areas are designed to provide a conducive environment for students to strive for excellence. The graduate programs offered here includes Geospatial, Climate Change Science, and Space Science.

The diversity of the programmes provide an excellent opportunity for students to broaden their horizon beyond their selected choice of study via talks such as the IPI seminar series. Students are also encouraged to engage in a variety of activities and and take leadership in organising some of the student activities. The multi-national background of the student community also provides an opportunity in expanding cultural horizons.

We look forward to you joining our diverse and dynamic community of researchers at IPI.

PROF. MADYA DR. ZAINI SAKAWI
Director
Institute of Climate Change

1. ORGANIZATION CHART



Top Management IPI

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pghikp@ukm.edu.my

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mardina@ukm.edu.my
DEPUTY DIRECTOR

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knam@ukm.edu.my

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HEAD OF CENTRE FOR TROPICAL CLIMATE CHANGE SYSTEM
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PROMOTION AND PUBLICITY COORDINATOR

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STRATEGY COORDINATOR

HEAD OF ADMINISTRATION
Mrs. Zie Fazleen Hashim
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2. RESEARCH FELLOWS

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email: zaini@ukm.edu.my

Expertise
* Waste Management
* Environmental Impact Assessment
* Odour Measurement And Analysis
* Social Impact Assessment

Prof. Ir. Dr. Mardina Abdullah
email: mardina@ukm.edu.my

Expertise
* Ionospheric Research
* Artificial Intelligant
* Satellite Navigation
* Manufacturing

Prof. Ir. Dr. Mandeep Singh Jit Singh
email: mandeep@ukm.edu.my

Expertise
* Satellite and Antenna Propagation

Associate Prof. Sr. Dr. Khairul Nizam Abdul Maulud
email: knam@ukm.edu.my

Expertise
* Geomatic
* Geographic Information System (GIS)
* Surveying & Mapping

Associate Prof. Dr. Marlia Mohd Hanafiah
email: mhmarlia@ukm.edu.my

Expertise
* Life Cycle Impact Assessment (LCA) and Environmental Footprinting of Green Materials and Energy
* Environmental Engineering
* Wastewater Treatment

Associate Prof. Dr. Wan Hanna Melini Wan Mohtar
email: hanna@ukm.edu.my

Expertise
* Environmental hydraulics
* Wastewater engineering

Associate Prof. Dr. Mohammad Rashed Iqbal Faruque
email: rashed@ukm.edu.my

Expertise
* Metamaterials
* Electromagnetic Compatibility
* Electromagnetic Wave & Propagation
* Antenna & Wireless Applicationion
* Electromagnetic Radiation

Dr. Teh Wai Leong
email: wteh@ukm.edu.my

Expertise
* Magnetospheric Physics
* Satellite Data Analysis

Dr. Sabirin Abdullah
email: dr_sabirin@ukm.edu.m

Expertise
*Ionospheric & GPS Research
* Radio Communication System

Dr. Kuhan Chandru A/l Balasanthiran
email: kuhan@ukm.edu.my

Expertise
* Astrobiology
* Organic Geochemically
* Marine Biology

Ts. Dr. Norsuzlin Mohd Sahar
email: norsuzlin@ukm.edu.my

Expertise
* RF & Microwave Antenna
* Astronomy Instrumentation

Dr. Ooi Chel Gee
email: chelgee.ooi@ukm.edu.my

Expertise
* Chemical weather prediction model (WRF-CMAQ)
* Biomass burning emission and transport
* Urban climate and pollution

Dr. Samir Salem Omair Al-Bawri
email: samir@ukm.edu.my

Expertise
* Wireless Communication
* RF and Microwave
* Antenna and Propagation
* Metamaterials
* Localization Estimation Techniques

Dr. Siti Norliyana binti Harun
email: sitinorliyana@ukm.edu.my

Expertise
* Life cycle assessment
* Water footprint
* Big data analytic

Dr. Ahasanul Hoque
email: ahasanul@ukm.edu.my

Expertise
* Microwave sensor for Satellite
* Metasurface Modelling
* Metasurface & Remote Sensing
* Metamaterial for satellite & Space applications
* Electromagnetic Plasmonic Metasurfaces

Ts. Dr. Wan Shafrina Wan Mohd Jaafar
email: wanshafrina@ukm.edu.my

Expertise
* Remote Sensing
* Geographical Information System (GIS)
* Machine Learning - Forest Carbon Modelling
* Land Use, Land Use Change and Forestry (LULUCF)

Dr. Wee Hin Boo
email: weehinboo@ukm.edu.my

Expertise
* Coral Reef Ecology
* Phylogenetics of symbiosis

Dr. Touhidul Alam
email: touhidul@ukm.edu.my

Expertise
* Satellite Communication
* Electromagnetic Radiation
* Antenna and Propagation
* Metamaterials
* Microwave Sensor

Dr. Noorashikin Md. Noor
email: noor@ukm.edu.my

Expertise
* Marine Biology
* Climate Change
* Environmental Science
* Aquaculture
* Fisheries Science
* Fisheries Management

3. GRADUATE STUDIES COMMITTEE

Chairman
Prof. Ir. Dr. Mardina Abdullah

Deputy Chairman
Prof. Madya Sr. Dr. Khairul Nizam Abdul Maulud

Secretariats
Zie Fazleen Hashim
Nurul Ain Nordin

Committee Members
Prof. Madya. Dr. Mohammad Rashed Iqbal Faruque
Prof. Madya Dr. Marlia Mohd Hanafiah
Dr. Noorashikin binti Md. Noor
Dr. Ooi Chel Gee
Ts. Dr. Norsuzlin Mohd Sahar

4. VISION AND MISSION

Vision

To become an educational and research institution as well as a referral center of international reputation in the field of climate change and space science

Missions

Through several programmes of studies and research activities, the institute will seek and augment the desired knowledge and expertise in the fields of climate change and space science for human advancement and well-being.

5. OBJECTIVES

- To put Malaysia in the world of international politics in the field of climate change and space science.
- To improve teaching at the undergraduate and doctorate levels in the field of climate and space science.
- To develop and enhance the skills and capabilities of universities in the field of climate science, meteorology, climatology, atmospheric and oceanographic science, impacts and adaptation research and produce graduates with a Master of science, doctorate and post-doctorate level.
- To be a hub for interdisciplinary and cross-border studies in conducting research and educating graduates.
- To become a depository center for data and monitoring for all matters related to climate and space science and thus be useful for commercial revenue through research, consultation, advocacy, and legislation.

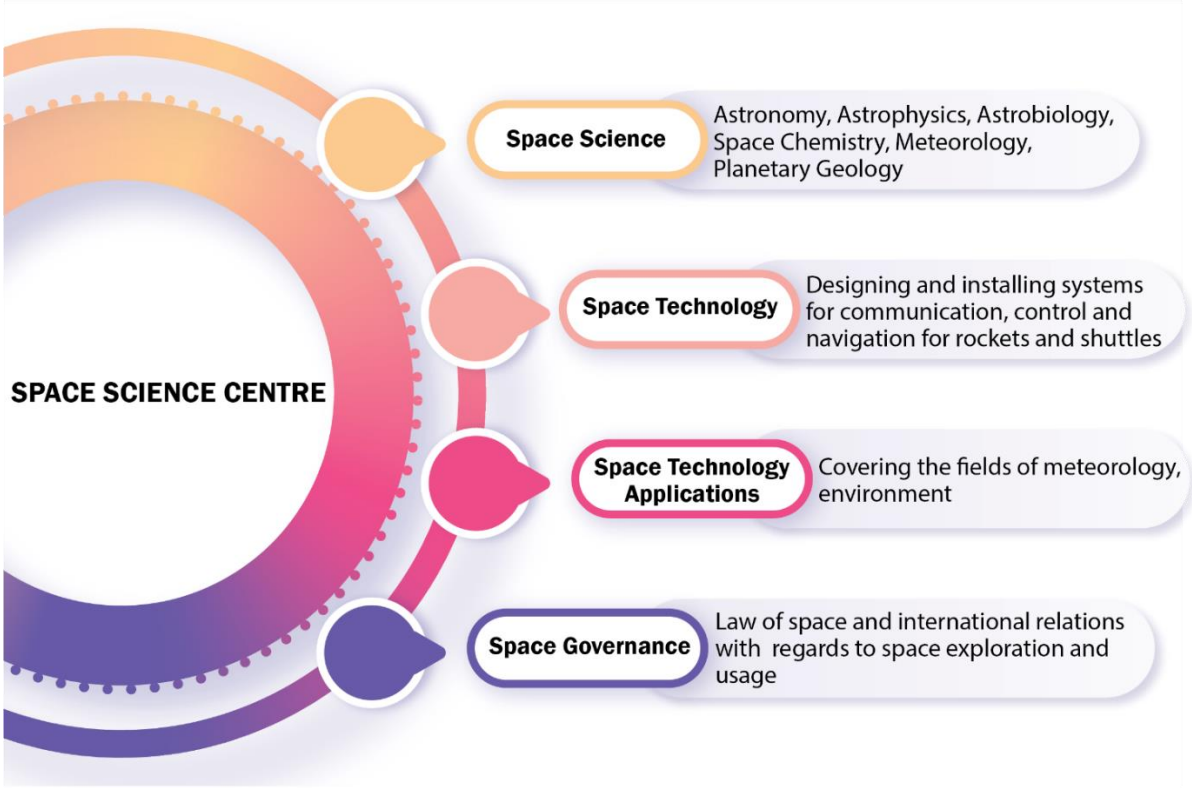
6. STRATEGIES

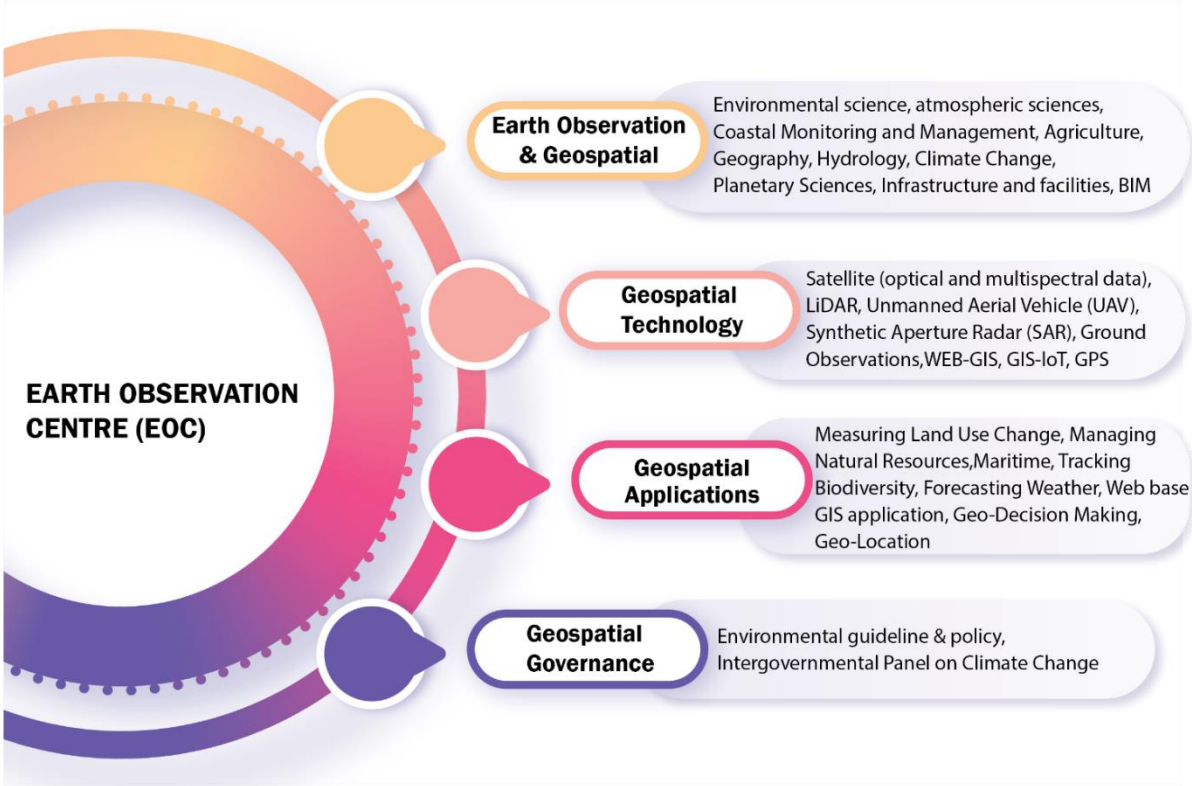
- To secure national and international research grants.
- To establish active research linkages and collaborations at the national and international levels.
- To enhance the graduate program through continuous professional development activities.
- To maximize research output via publications, patents, and products.
- To provide opportunities for staff to undergo training for career advancement.
- To actively seek and maintain smart partnerships with industry.
- To fulfill the role as a higher institution Centre of Excellence (CoE).

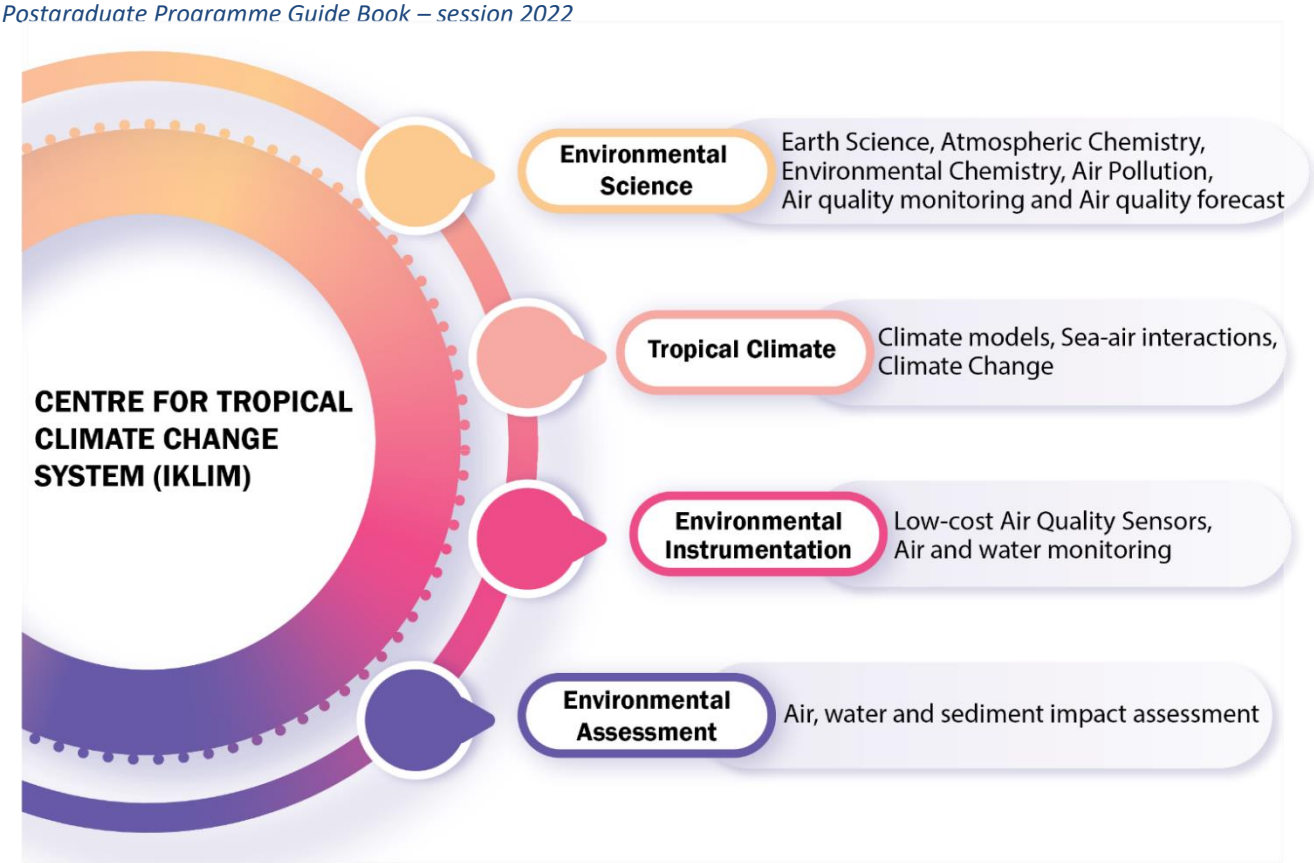
7. GOALS

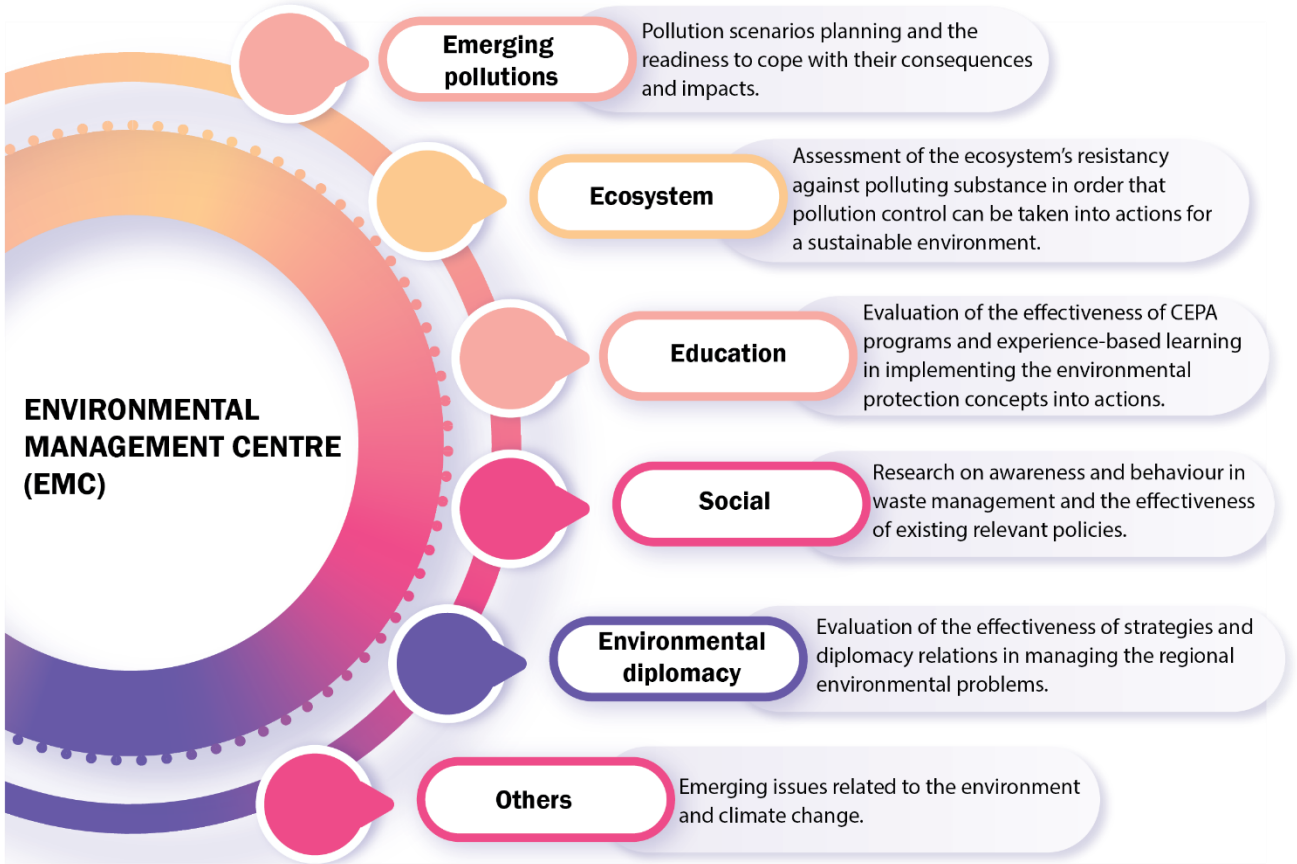
- To produce knowledgeable graduates with commitments to professional values and works ethics.
- To tackle identified deficiencies in research fields and propel the research quality to international level.
- To strengthen industry collaborations and community involvements to generate, spread and share information, knowledge and expertise in the fields of climate change and space sciences.

8. RESEARCH AREAS

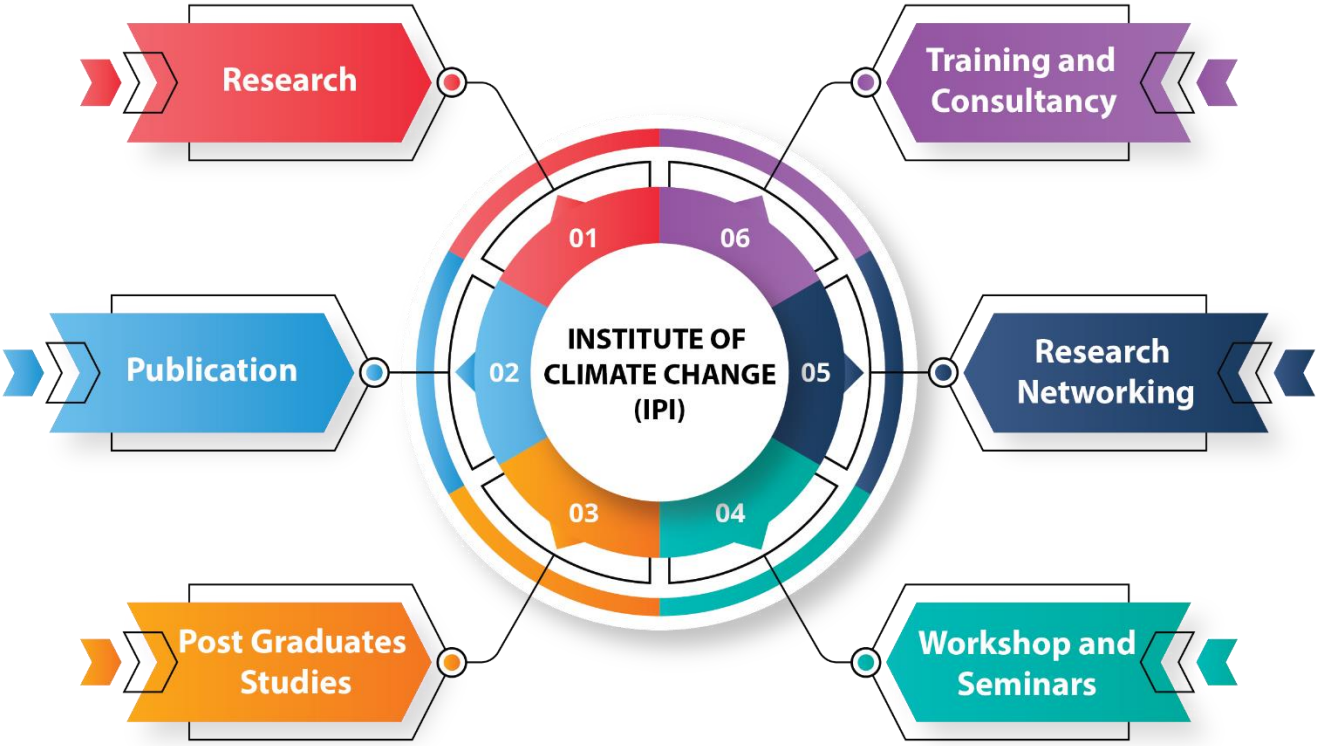





CENTRE FOR TROPICAL CLIMATE CHANGE SYSTEM (IKLIM)
Environmental Science
Earth Science, Atmospheric Chemistry, Environmental Chemistry, Air Pollution, Air quality monitoring and Air quality forecast
Tropical Climate
Climate models, Sea-air interactions, Climate Change
Environmental Instrumentation
Low-cost Air Quality Sensors, Air and water monitoring
Environmental Assessment
Air, water and sediment impact assessment


ENVIRONMENTAL MANAGEMENT CENTRE (EMC)
Emerging pollutions
Pollution scenarios planning and the readiness to cope with their consequences and impacts.
Ecosystem
Assessment of the ecosystem's resistancy against polluting substance in order that pollution control can be taken into actions for a sustainable environment.
Education
Evaluation of the effectiveness of CEPA programs and experience-based learning in implementing the environmental protection concepts into actions.
Social
Research on awareness and behaviour in waste management and the effectiveness of existing relevant policies.
Environmental diplomacy
Evaluation of the effectiveness of strategies and diplomacy relations in managing the regional environmental problems.
Others
Emerging issues related to the environment and climate change.

9. TEACHING AND LEARNING METHODS



01 Learning carried out in institutes is based on research.

02 Research work carried out by students given autonomy to manage their own research project and monitored by every respective project leader.

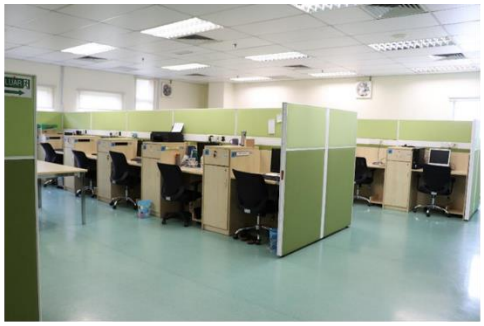
03 Each student has to present their progress report periodically. Progress report presentation also held in seminar format that organised by institute every year.

10.FACILITIES

Infrastructure

Among infrastructure provided in IPI are:

LABORATORIES	LOCATION
IPI Post-Graduate Laboratory	Research Complex, UKM
Satellite Communication Laboratory	Research Complex, UKM
IPI Seminar Room	Research Complex, UKM
Environmental Spatial Analysis Laboratory	Earth Observation Centre, Institute of Climate Change



POSTGRADUATE STUDENT ROOM

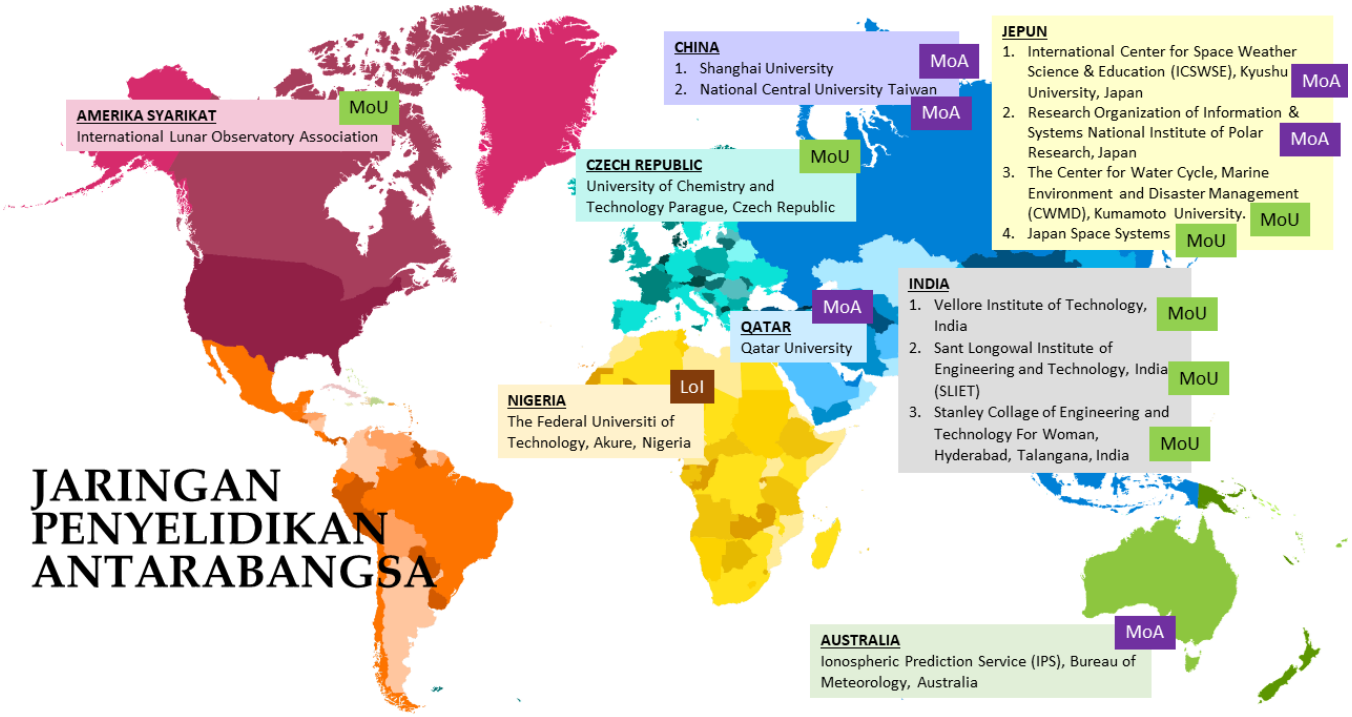
SATELLITE COMMUNICATION LABORATORY

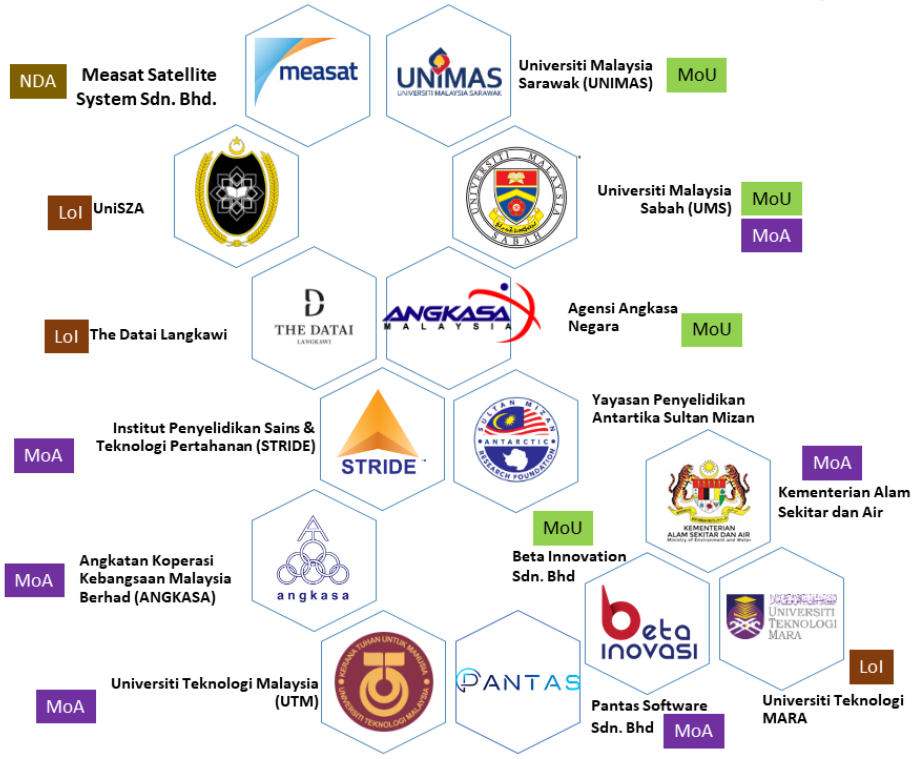
IPI SEMINAR ROOM

Environmental Spatial Analysis Laboratory, EOC

11.COLLABORATIVE RESEARCH

IPI has established collaboration with several organizations / institutions within and outside the country as follows:





12.GRADUATES PROGRAMME

a) RESEARCH MODE

I. DOCTOR OF PHILOSOPHY (PhD) AND MASTER (MSc)

Thesis in topics as follow:

- Space Science
- Climate Change Science
- Geospatial

II. GRADUATE STUDIES

IPI offers two (2) years for master and four (4) years for PhD targeted to students who are interested in doing space, geospatial, and climate change research. IPI attracts international students and conducts the program in English and/or Bahasa Melayu.

III. PROGRAM STRUCTURE

The Master (MSc) and Doctor of Philosophy (PhD) programs in IPI are developed and guided by research fellows and professors at IPI. The program begins with a one (1) week orientation course in which students will be trained to become familiar with basic research practices and ethics. This course comprises thesis writing skills, publication ethics, and UKM regulations.

This program is offered either as part-time and full-time. All intellectual properties developed and collected at IPI belong to UKM. Therefore, all registered students are required to sign a confidential disclosure and limited use agreement.

IV. ENTRY REQUIREMENTS

Academic Qualification

- **Master of Science (MSc)**
  - An Honour's degree or its equivalent in relevant areas which are recognised by the Senate with a Cumulative Grade Point Average (CGPA) of 2.75 and above; **or**
  - An Honour's degree or its equivalent in relevant areas with a CGPA between 2.50 to 2.75 (or equivalent) will be accepted after passing internal evaluation; **or**
  - An Honour's degree or its equivalent in relevant areas with a CGPA less than 2.50 (or equivalent) with more than 5 years of related industrial experience, will be accepted after passing internal evaluation

- **Doctor of Philosophy (PhD)**
  - A Master's degree in relevant areas which are recognised by the Senate; **or**
  - Other related qualifications which are recognised by the Senate as equivalent; **or**

  - (Fast Track Route) Bachelor's Degree (honour) with First Class Honour (CGPA: above 3.67), or equivalent recognition from Universiti Kebangsaan Malaysia, or other Institute of Higher Learnings recognised by the MQA, or other equivalent international standardizing bodies; **or**
  - Master's programme at the Universiti Kebangsaan Malaysia and being recommended by the Graduate Studies Committee and the relevant faculty for conversion to the Doctor of Philosophy (PhD) programme with the approval of Senate.

English Proficiency

International students are required to obtain a minimum English Language test score as a prerequisite for entry into graduate programmes at UKM:

- **IELTS** : Minimum Band 6.0
- **TOEFL** : Minimum 60 (iBT) or 550 (PBT)
- **CEFR** : Level Mid B2
- **MUET** : Minimum Band 4

In special cases, in case both both requirements were not met, students will be required to attend and pass the English Placement Test (EPT) conducted by Centre for Graduate Management, PPS, UKM. Those who do not pass the EPT then must take and pass the English Module UKM for one semester before graduating.

V. REQUIREMENTS FOR GRADUATE PROGRAMMES AT IPI

Student would have to defend their thesis for graduation via a final viva examination
The requirements for this are the following:

- Requirements Overview

- General

Unless stipulated otherwise, the following general rules apply:

(i) Students must observe strict confidentiality in all aspects relating to research activities, research methodology course and workshop.
(ii) Students can only be excused from daily research activities, research methodology course and workshop by obtaining prior permission from their respective supervisor/ person in-charge.
(iii) Students whose unsatisfactory performance during the course may be required to attend for an additional evaluation before an award of their Masters/Phd is made.
(iv) Students are expected to be professional during their time at IPI and adhere to rules and cultural norms of UKM and in Malaysia.

- Journal Publications as a Condition for Graduation

Candidates are required to publish at least 1 (for Masters) and 2 papers (for PhD), in an indexed journal of WoS as a requirement to graduate.

VI. Research Intensive Course

All Masters and PhD candidates are required to attend and pass a Research Methodology Course (ZFSS 6014 for Masters; ZFDS 8014 for PhD) which is registered at IPI.

International candidates are required to attend a Bahasa Melayu (BM) course, depending on the candidate's region of origin, that is registered by CITRA UKM and must pass it:

Categories of International candidates	Code and Name of Courses
Non- Nusantara	LMCM1083 Bahasa Melayu Komunikasi Antarabangsa
Nusantara	LMCM1093 Bahasa Melayu Untuk Pelajar Nusantara

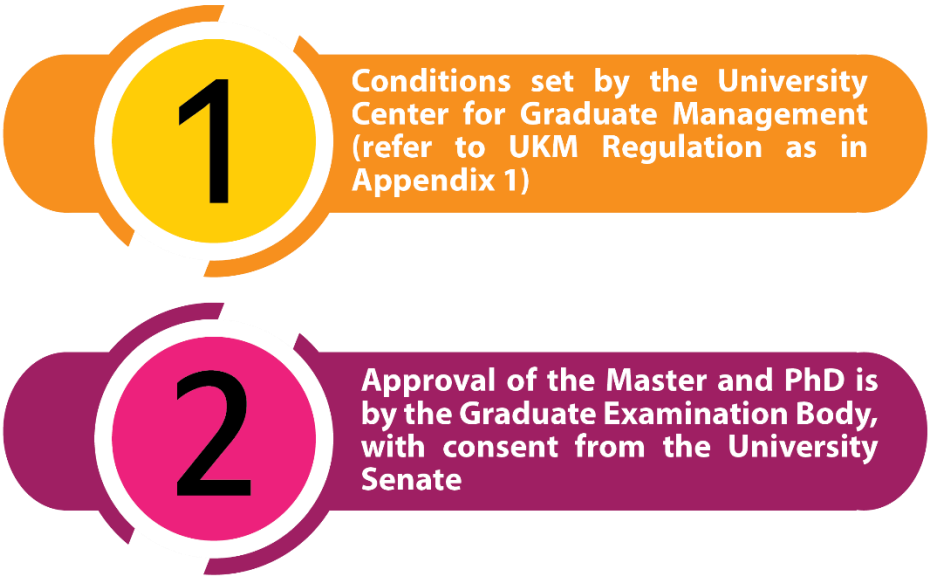
Nusantara: Singapore, Brunei Darussalam, Indonesia dan Southern Thailand

VII. INTELLECTUAL PROPERTY

All Master and PhD candidates are required to understand, agreed and sign the **CONFIDENTIAL DISCLOSURE AND LIMITED USE AGREEMENT** between IPI and post-graduate researchers with the objective to protect University-Owned Confidential Information and Intellectual Property rights.

VIII. AWARD OF MASTER AND PhD

Award of Master and PhD to successful candidates is based on:



IX. DURATION OF STUDY

PROGRAMMES	FULL TIME	PART TIME
Master of Science	4 – 6 semesters	6 – 8- semesters
Doctor of Philosophy	6 -12 semesters	8 – 14 semesters

X. INTAKE

All Masters and PhD candidates by research can register at any time throughout the year.

XI. FEES

LOCAL/ INTERNATIONAL	REGISTRATION (RM)	1ST SEMESTER (RM) (Registration, Service Activity & Tuition Fees)	SUBSEQUENT SEMESTER (RM) (Service Activity & Tuition Fees)	TOTAL FEES (MIN SEM)	MIN SEM
MASTER OF SCIENCE					
Local	1,010	4,155	3,145	13,590	4
International	1,410	7,970	6,560	27,650	4
DOCTOR OF PHILOSOPHY					
Local	1,010	4,190	3,180	20,090	6
International	1,710	10,010	8,300	51,510	6

XII. STUDENTS' ACTIVITIES

Students are required to attend teaching/learning sessions which includes:

- **IPI Research Colloquium**
  The colloquium gives the opportunity for students to present their current research progress in a power point. The colloquium is held once a year.

- **IPI Seminar Series and Workshops**
  The goal of the Seminars is for research fellows, students and research officer to share their recent research findings or anything related to their research in a general manner. The content of the talk may include theories, research findings, progress report, or networking activities. Public Lectures are usually done by visiting researchers. These activities are opened to all the UKM students, research assistants, laboratory assistants, science officers, research officers, fellow researchers, professors.

- **Orientation Briefing**
  All Master and PhD candidates are required to attend an orientation briefing organized by IPI during the 1st year of registration. The briefing aims to introduce graduate students to basic laboratory SOP, rules and regulations.

XIII. EVALUATION ON STUDENTS

PROGRESS REPORT

The students research progresses are constantly evaluated by the research supervisors and co-supervisors. The progress reports are required to present in the power point format in the series seminar or colloquium as mentioned above.

PRESENTATION

Students need to present their research findings in the related conferences in oral or poster presentation at least once in their study period as part of the progress report evaluation. Annual International conferences organized by IPI or another collaborators can be used as a media to share research finding.

b) COURSEWORK MODE

I. PROGRAM NAME:

MASTER IN CLIMATE CHANGE (COURSEWORK MODE)/ SARJANA PERUBAHAN IKLIM (MOD KERJA KURSUS)

II. Introduction:

The philosophy of creating this programme is for the development of knowledge related to climate change with a combination of theory, practice and current applications that could be introduced towards mitigation of climate change issues. . The programme offered are in line with technological developments and changes related to climate change issues that are relevant to national development planning, including justifications to support National Key Economic Result Areas (NKEAs) such as Agriculture; Oil, Gas and Energy; Hospitality and Tourism; Advanced Engineering, Science and Innovation. Wide range of fields related to climate change are covered under this programme including climate change science and prediction, geographical information system (GIS), remote sensing, climate change policy and economics, outdoor excursion, and space science knowledge. The research programme falls under Environmental Science (0521) under the NEC-2020. This offering is also in line with current technological developments and changes. Learning needs also apply to the 4.0 industrial revolution.

III. Research approach and duration:

The type of study is full-time for local and foreign candidates. The usual duration / period of study is one (1) year or two (2) semesters. Students may apply for additional study time after the expiration of the normal period in writing to the Dean/Director subject to a maximum of four (4) semesters. Students whose duration of study exceeds the maximum number of years including additional time may be terminated. Regardless of the prescribed period, students may apply for an additional time of one (1) semester only subject to the decision of the Senate. Students who are approved for extra study time are not allowed to postpone their studies during the semester except for health reasons confirmed by a medical specialist.

The minimum and maximum duration of study is as below:

Study mode	Minimum Duration	Maximum Duration
Full time	1 year (2 semesters)	2 years (4 semesters)

IV. Programme Educational Objective/ Objektif Pendidikan Program (OPP)

OPP1: Graduates who are knowledgeable, skilled and experienced in a comprehensive and up-to-date climate change sciences.
OPP2: Graduates who are competent in soft skills in conducting climate change research and applying it to real-life situations.
OPP3: Graduates have technical skills and can play a role as reference experts in various disciplines increase productivity and competitiveness in the field of climate change science.
OPP4: Graduates skilled in national and international level communications and collaborations.

V. Programme Outcome / Hasil Pembelajaran Program (HPP)

At the end of the programme, the students would be capable of:

HPP1: Master basic knowledge and have forward thinking in the field of climate change.
HPP2: Apply theory, strategy and technology in the field of climate change.
HPP3: Assess and solve complex problems in the field of climate change creatively and innovatively.
HPP4: Perform tasks in the field of climate change ethically, professionally and emotionally.
HPP5: Communicate in oral and written form and use digital media effectively in the field of climate change.
HPP6: Research and process data analytically and numerically to contribute new knowledge in the field of climate change.
HPP7: Apply knowledge of climate change in daily activities.

VI. Programme Structure

The programme is implemented on a coursework basis and offers 48 units credit hours. Students are required to take 9 compulsory courses including research projects and students are required to take 2 out of the 4 elective courses offered. The number of units that need to be passed is 42 units. The programme is only available in for FULLTIME study only.

Compulsory courses programme	=24 unit
Elective courses programme	= 6 unit
Research projects paper	=12 unit
Total Units	=42 unit

VII. List of Courses

Component		Semester 1			Semester 2		
		Code	**Course**	**Credit hours**	**Code**	**Course**	**Credit hours**
Compulsory courses	**Compulsory programme**	ZFPI6014	Research Methodology	4	ZFPI 6124	Climate Change Economics and Policy	4
		ZFPI6114	Climate Science and Prediction	4	ZFPI 6133	GIS Analysis in Climate Change	3
		ZFPI6113	Remote Sensing and Global Climate Change	3	ZFPI 6143	Emission Measurement and Monitoring	3
		ZFPI6123	Climate Change Excursion	3			
	Thesis/ Dissertation/ Scientific project paper	ZFPI6034	Research Project 1	4	ZFPI 6038	Research Project 2	8
Elective courses	**Elektif Program**	ZFPI6213	Land Use and Climate Change	3	ZFPI 6233	Satellite-based Applications on Climate Change	3
		ZFPI6223	Introduction to Space Physics	3	ZFPI 6243	Ionosphere and Communication in Climate Change	3
Jumlah Jam Kredit		-		24	-		24

VIII. Courses Synopsis and References

ZFPI 6014: Research Methodology (4 Credits; Compulsory)

This course is intended to provide an overview and principle to conduct a scientific research. It includes ethics in research that will discuss the principle of research and researchers' roles in various aspects. Techniques on literature research, experimental design, preparation of a research proposal, oral and written presentation of results, and an introduction to the research activities at the Institute of Climate Change (IPI) are the topics categorized under research management. Rules and regulations, legal aspects and safety of the works place will be discussed during the introduction of intellectual properties (IP) and asset. Thesis writing topic will be emphasized on the writing style and formatting with reference to the "UKM Thesis Writing Styles" (Penulisan Tesis Gaya UKM). The lectures and discussion sessions are designed to cater the listed specific topics. Course assessment is based on the quality of written research proposal prepared by the students and the presentation of the proposal at a seminar.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Graustein, J.S. 2020. How to Write an Exceptional Thesis or Dissertation: *A Step-by- step Guide from Proposal to Successful Defense*. Ocala: Atlantic Publishing Company.

Greenfield, T. 2015. *Research Method for Postgraduates*. Ed. Ke-3. London: Wiley.

Menell, P. S., Lemley, M. A., Merges, R. P., Balganesh S.: *Intellectual Property in the New Technological Age 2020. Vol I Perspectives, Trade Secrets and Patents.* Clause 8 Publishing, 531p.

Menell, P.S., Lemley, M.A. & Merges, A.P. 2016. *Intellectual Property in the New Technological Age: 2016: Vol. I Perspectives, Trade Secrets and Patents*. Clause 8 Publishing, 546p.

Pusat Siswazah, 2015. *Panduan Penulisan Tesis GAYA UKM, Cetakan Ketiga*, Universiti Kebangsaan Malaysia, ISBN: 978-983-2975.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :

HPK1: *Plan scientific research*
HPK2: *Deliver effectively research proposal in writing and oral presentation*
HPK3: *Identify the relevant philosophy and ethics when conducting research*
HPK4: *Relate theory and practical in research*
HPK5: *Preparing a research proposal according to the required format*
HPK6: *Identify the legal and commercial aspects of research findings*

ZFPI 6034: Research Project 1 (4 Credits; Compulsory)

This course aims to train the students to conduct a research on a specific topic in climate change field through reading and directed research. Students are required to prepare a progress report for the selected research topic for the assessment.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Dawson, C. 2019. Introduction to Research Methods 5th Edition: A Practical Guide for Anyone Undertaking a Research Project. Little, Brown Book Group.
Greenfiled, T. 2016. Research Methods for Postgraduates. 3rd Ed. London: An Arnold Publication.
UKM Graduate Centre. 2015. The UKM Style Guide. Bangi: Graduate Studies Centre, UKM.
Trochim, W. M, Donnelly, J. P., Arora, K. 2015. Research Methods: The Essential Knowledge Base. Cengae Learning Inc.
Pusat Pengurusan Siswazah UKM. 2015. Panduan Penulisan Tesis Gaya UKM. Edisi Semak Kedua. Bangi: Penerbit UKM.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :
HPK1: Analyse on the selected topic in the climate change field
HPK2: Give evaluations on the selected topic in the climate change field
HPK3: Organise a research project in the climate change field

ZFPI 6114: Climate Science and Prediction (4 Credits; Compulsory)

The purpose of this course is to first provide an understanding of the scientific basis behind climate change and its indicators. An understanding of weather and climate differences is also emphasized. Additionally, the influence of greenhouse gases on global warming and its impacts on physical environment and atmospheric chemistry are discussed in depth. This course will also introduce the measurement and modelling tools for climate prediction. The climate change indicators are analysed and interpretated using basic python programming to judge the existence of the phenomenon. Basic knowledge on the types, design and mechanism of climate models are taught to provide an overview on the current modelling capacity and limitation.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Hidore, J.J., Oliver, J.E., Snow, M., Snow, R.; Climatology: An Atmospheric Science, 3rd Edition; Pearson, 2020.
Fletcher, C.; Climate Change: What the Science Tells Us, 2nd Edition; John Wiley and Sons: 2018.
Seinfeld, J.H.; Pandis, S.N. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change; John Wiley & Sons: 2016.
Goosse, H.; Climate System Dynamics and Modelling; Cambridge University Press, 2015.
Bonan, G.; Climate Change and Terrestrial Ecosystem Modeling; Cambridge University Press, 2019.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :
HPK1: Ability to differentiate weather and climate related phenomenon;
HPK2: Ability to evaluate and draw conclusions related to the relationship between climate and air quality;
HPK3: Ability to make judgement on the existence of climate change via the taught programming, analysis and prediction skills;

ZFPI 6113: Remote Sensing and Global Climate Change (3 Credits; Compulsory)

The purpose of this course is to explore the role of remote sensing in monitoring planetary scale phenomena, with particular focus on the use of techniques and instrument designed to monitor the global environmental properties of the Earth. Remote Sensing from satellite platforms has become increasingly important as the only way to obtain environmental data at the spatial and temporal coverage needed to understand the processes governing global climate change. The course will also provide exposure to students on the critical discussion to the significance of remote sensing measurements for testing existing models, such as ozone depletion, the hydrological cycle, carbon cycle, global climate change and other aspects of earth's environment.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Emilio Chuvieco. 2020. Fundamentals of Satellite Remote Sensing an Environmental Approach. CRC Press Taylor & Francis Group.
Jude Hemanth. D. 2019. Artificial Intelligence Techniques for Satellite Image Analysis. Springer.
Jian Guo Liu and Philippa J. Mason. 2016. Image Processing and GIS for Remote Sensing. Wiley Blackwell.
Prasad S. Thenkabail, John G. Lyon and Alfredo Huete. 2018. Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation (Hyperspectral Remote Sensing of Vegetation). CRC Press Taylor & Francis Group.
Matt Weilberg. 2019. Advances in Photogrammetry, Remote Sensing and Spatial Analysis. Callisto Reference.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :
HPK1: Ability to provide a detailed overview of remote sensing techniques for measuring planetary scale processes, to convey the importance of such measurements and to explore how understanding in this subject has been developed;
HPK2: Ability to explore issues of data quality, accuracy, validation and reliability, when critically assessing the value of remotely sensed data;
HPK3: Ability to gain knowledge of appropriate remote sensing terminology and able to think about remote sensing within a wider subject and to emphasize the role of remote sensing as a compliment rather than an alternative to other monitoring methods;
HPK4: Ability to critically identify and analyse complex problems in the field of remote sensing and global climate change.

ZFPI 6123: Climate Change Excursion (3 Credits; Compulsory)

This course aims to provide students with the opportunity to develop their knowledge and to understand climate change through analysing real world contexts and apply climate change scenario in practice. This course will take students on an educational tour/field trip as to expose student to experience first-hand concepts on climate change which will help in long term retention of the knowledge. This course will encourage student's participation on addressing climate change as social issue such as efforts to reduce the impact of climate change on vulnerable communities. Through this climate change excursion course, students will train to work in independent and group to run research methods in climate change as the final deliverable at the end of the course.

Prerequisite:

No

Course Requirements to sit for the Examination:

Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Kerry Emanuel and Bob Inglis. 2018. What We Know About Climate Change. The MIT Press.

Joseph Romm. 2018. Climate Change: What Everyone Needs to Know. Oxford University Press.

Andrew E. Dessler. 2019. The Science and Politics of Global Climate Change: A Guide to the Debate. Cambridge University Press.

Hugh Ross. 2020. Weathering Climate Change: A Fresh Approach. RTB Press.

Thomas E. Lovejoy and Lee Hannah. 2019. Biodiversity and Climate Change: Transforming the Biosphere. Yale University Press. New Haven & London.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)

At the end of the course, student should be able to :

HPK1: Ability to apply concept, knowledge and critical thinking and capable in solving the problem using scientific skills;

HPK2: Ability to integrate the data quality and information analysis by interpret scientifically the climate change studied;

HPK3: Ability to apply the leadership skills in managing group work and independent task and ability to effectively work in a team environment.

ZFPI 6213: Land Use and Climate Change (3 Credits; Elective)

The purpose of this course is to study the effects of climate change on land use and the corresponding feedback effects of land use on greenhouse gas (GHG) emissions. Through this course, a comprehensive analysis of climate change and land use in relation to food security and environmental sustainability will be conducted. This course will also overview the global Nitrogen (N) and carbon (C) cycles and will look into regional differences in land use and agricultural/silvicultural traditions in developed versus developing countries. At the end of this course, student will be able to analyse how the differences in land use systems can be managed to adapt to current and long-term climate change.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Doug Kelbaugh. 2019. The Urban Fix: Resilient Cities in the War Againts Climate Change, Heat Island. Routledge. Taylor & Francis Group.

Michael R. Boswell, Adrienne I. Greve and Tammy L. Seale. 2019. Climate Action Planning: A Guide to Creating Low-Carbon, Resilient Communities. Island Press.

Rawshan Ali, Zhao Chunju and Zhou Yihon. 2018. Impact of Climate Change and Landuse on Water Resources Development. Lap Lambert Academic Publishing.

Victor R. Squires and Mahesh K. Gaur. 2020. Food Security and Land Use Change under Conditions of Climatic Variability. Springer.

Ganaboina Machender and Ramanathan, A.L. 2020. An Understanding the role of Land Use, Cover and the Climate Change. Lap Lambert Academic Publishing.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to:

HPK1: Ability to evaluate how land use and land use change is affecting climate change, describe global, regional and local impacts of climate change on agriculture and forestry, and identify global demand for arable land and drivers of land use change

HPK2: Ability to select and apply relevant scientific tools to analyse options for climate change adaptation in agriculture and forestry;

HPK3: Ability to discuss the current issue on land use and the future perspectives for sustainable land use and able to compare global, regional and local land use governance policies;

HPK4: Ability to discuss on drivers of climate change on land use and able to cooperate and work in group and independently on investigating case specific related to climate change and land use.

ZFPI 6223: Introduction to Space Physics (3 Credits; Elective)

The objective of the course is to introduce the fundamental space plasma physics, focusing on the solar-terrestrial physics. The topics include: the upper atmosphere and ionosphere, physics of magnetized plasmas, magnetohydrodynamic (MHD) waves, the Sun and its atmosphere, the solar wind and heliosphere, the terrestrial magnetosphere, and solar wind-magnetosphere coupling.

Prerequisite:

No

Course Requirements to sit for the Examination:

Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Parks, G. K. (2019). Physics of Space Plasmas: An Introduction. CRC Press

Gerard Belmont, Laurence Rezeau, Caterina Riconda, and Arnaud Zaslavsky (2019). Introduction to Plasma Physics. ISTE Press.

Donald A. Gurnett and Amitava Bhattacharjee (2017). Introduction to Plasma Physics: With Space, Laboratory and Astrophysical Applications. Cambridge University Press.

Alexander Piel (2017), Plasma Physics: An Introduction to Laboratory, Space, and Fusion Plasmas.

Russell, C. T., Luhmann, J. G., and Strangeway, R. J. (2016). Space Physics: An Introduction. Cambridge University Press.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)

At the end of the course, student should be able to :

HPK1: Ability to understand the fundamental theory and concept of space physics.

HPK2: Ability to classify and interpret satellite data in the solar-terrestrial space.

HPK3: Ability to evaluate the issues of space plasma physics using theory and practice.

ZFPI 6038: Research Project 2 (8 Credits; Compulsory)

This course aims to train the students to conduct a research on a specific topic in climate change field through reading and directed research. Students are required to prepare a dissertation for the selected research topic for the assessment.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Dawson, C. 2019. Introduction to Research Methods 5th Edition: A Practical Guide for Anyone Undertaking a Research Project. Little, Brown Book Group.

Greenfiled, T. 2016. Research Methods for Postgraduates. 3rd Ed. London: An Arnold Publication.

UKM Graduate Centre. 2015. The UKM Style Guide. Bangi: Graduate Studies Centre, UKM.

Trochim, W. M, Donnelly, J. P., Arora, K. 2015. Research Methods: The Essential Knowledge Base. Cengae Learning Inc.

Pusat Pengurusan Siswazah UKM. 2015. Panduan Penulisan Tesis Gaya UKM. Edisi Semak Kedua. Bangi: Penerbit UKM.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :
HPK1 : Ability to analyse on the selected topic in the climate change field
HPK2 : Ability to give evaluations on the selected topic in the climate change field
HPK3 : Ability to organise a research project in the climate change field
HPK4 : Ability to produce a dissertation for the research project in climate change field in master level

ZFPI 6124: Climate Change Economics and Policy (4 Credits; Compulsory)

The aim of this course is to provide basic understanding of climate change economics and policy from international and domestic perspective. This course will introduce key concepts and terminologies related to climate change economics and policy such as tragedy of the commons, market failure, externalities, carbon pricing, UNFCCC, IPCC etc. This course will cover important topics of climate change economics and policies including treaties, negotiations and national pledges; loss and damages, limits to adaptation and residual risk; cost benefit analysis; low carbon economy; climate resilient development; policy instruments such as market-based, command and control, emission trading scheme, and cap and trade program, and their application in Malaysia. This course will also explore climate change financing; mainstreaming mitigation and adaptation into development planning; as well as synergies and trade-offs between mitigation, adaptation, DRR and SDGs. This course meets the multi and inter disciplinary needs of climate change knowledge and research in order to generate and best train the next generation of scientists, researchers, decision makers and informed citizen.

Prerequisite:

No

Course Requirements to sit for the Examination:

Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Gates, B. 2021. How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need. Penguin Books Ltd: London, United Kingdom.

Laurent, E. 2020. The New Environmental Economics: Sustainability and Justice. Polity Press: Cambridge, UK ; Medford, MA.

Mishan, E.J. and Quah, E. 2020. Cost-Benefit Analysis (6th Edition). Routledge (Taylor & Francis Group), United Kingdom.

IPCC, 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Cambridge University Press, Cambridge, United Kingdom and New York, USA.

Harris, J. M. Roach, B. and Codur, A-M. 2017. The Economics of Global Climate Change. @ 2017 Global Development and Environment Institute, Tufts University, USA.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)

At the end of the course, student should be able to :

HPK1: Ability to understand an overview of economic and policy aspects of climate change including key concepts and terminologies

HPK2: Ability to understand costs, benefits, and co-benefits of mitigation and adaptation measures

HPK3: Ability to apply a range of economic and policy instruments in response to climate change

HPK4: Ability to evaluate climate change policies in the context of national interest and equity in international negotiations

ZFPI 6133: GIS Analysis in Climate Change (3 Credits; Compulsory)

The goal of this course is to expose the students in the field of Geographic Information Systems (GIS) in climate change. Sharing to current geospatial technology and its applications will be disclosed to students. The objective of this course is to present and educate students in the field of GIS and climate change, where students will be actively exposed to relevant theories through lectures, technical lab, mini projects, training and self-learning. Geospatial projects will focus on the implementation and integration of GIS in climate change analysis and modeling. Students need to use GIS software such as ArcGIS and Q-GIS as a tool and medium to solve problems related to climate change. Students are also exposed to the impact of climate change and how GIS in helping to find solutions.

Prerequisite:

No

Course Requirements to sit for the Examination:

Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Andy Mitchell. 2020. Edisi Kedua. The Esri Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships. Esri Press.

Bradley A. Shellito. 2018. Edisi Keempat. Introduction to Geospatial Technologies. United State of America: W. H. Freeman and Company.

Janardhanan Sundaresan K M SantoshAndrea DériRob RoggemaRamesh Singh. 2015. Geospatial Technologies and Climate Change. Springer Nature

Kang-tsung Chang. 2018. Edisi Kesembilan. Introduction to Geographic Information Systems. McGraw-Hill Education.

Michael Law, Amy Collins. 2018. Edisi Kelima. Getting to Know ArcGIS Desktop. Esri Press.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)

At the end of the course, student should be able to:

HPK1: Able to apply the field of GIS to solve the climate change problem

HPK2: Ability to follow the process of analyzing spatial data and attributes using the latest software and methods

HPK3: Able to develop GIS model and application related to climate change

HPK4: Ability to interpret the results of GIS analysis in solving climate change problems

ZFPI 6143: Emissions Measurement and Monitoring (3 Credits; Compulsory)

This course discusses the concept and introduction to emissions measurement and monitoring through modeling approach. Measurement through modeling such as Life Cycle Assessment (LCA) and Carbon Footprint will be introduced as a basic and systematic analysis at global and national levels as well as material and energy flows and uses that are associated with processes and activities. Energy consumption, non-renewable and renewable materials consumption, air pollutant emissions and environment associated with human activities are discussed. The course provides students with analytical tools and methods for implementing principles of modelling of environmental impacts. The practical applications covered in the course are based largely on current research in the area of LCA and Carbon Footprint. The definition and concept of LCA and Carbon Footprint as a comprehensive tool for identifying and evaluating the full environmental burdens associated with a product system from production through disposal are explained.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Curran, M.A. 2020. Life-Cycle Assessment: Inventory Guidelines and Principles. CRC Press, USA.
Li, L., Wong-Ng, W., Huang, K. & Cook, L.P. 2018. Materials and Processes for CO2 Capture, Conversion, and Sequestration. Wiley, USA.
Marimuthu, C. & Kirubakaran, V. 2020. Life Cycle Assessment of Renewable Energy: Carbon, Energy and Economic Payback Period. LAP Lambert Academic Publishing, Mauritius.
Ren, J. 2020. Renewable-Energy-Driven Future: Technologies, Modelling, Applications, Sustainability and Policies. Academic Press, United Kingdom.
Zhou, S.W.W. 2020. Carbon Management for a Sustainable Environment. Springer, Switzerland.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to :
HPK 1: Ability to understand fundamentals, concepts, principles and methods of the new discipline in measuring and monitoring emissions
HPK 2: Ability to learn how to use specialized tools for measuring and monitoring emissions
HPK 3: Ability to understand and practice critical-thinking for sustainable environment monitoring

ZFPI 6233: Satellite – Based Applications for Climate Change (3 Credits; Elective)

The purpose of this course is to provide an understanding of the various domains of space science at the basic level, concepts and applications. A satellite is one of the objects in space that surrounds a planet. This satellite technology is designed as a remote sensing device that can collect information and data from the earth and its surroundings. The integration of these artificial satellites and sensors is also used for a variety of applications including military and civilian use, earth monitoring, communications, navigation, weather and research. This course exposes students to an introduction to the basics of satellite systems as well as sensor instruments that can access earth's surface data for monitoring applications. Several case studies will be discussed on the development of satellite technology in disaster management, environmental degradation and climate change.

Prerequisite:
No

Course Requirements to sit for the Examination:
Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:
Louis J. Ippolito, Jr. 2008. Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance, (2nd ed.) John Wiley & Sons.
Timothy Pratt, Jeremy E. Allnutt. 2019. Satellite Communications (3rd ed.). Wiley
Gerard Maral, Michel Bousquet, Zhili Sun. 2020. Satellite Communications Systems (6th ed.) Systems, Techniques and Technology. Wiley
Brünner, C., Königsberger, G., Mayer, H., Rinner, A. .2018. Satellite-Based Earth Observation. Springer
Hossain, Faisal. 2016. Earth Science Satellite Applications, Current and Future Prospects. Springer

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)
At the end of the course, student should be able to:
HPK1: Ability to identify the earth and space segments of satellite systems and subsystems.
HPK2: Ability to classify the characteristics of passive and active sensors in satellite systems and examine sensor data for weather, climate, and environmental monitoring applications
HPK3: Ability to evaluate the interaction of sensor satellite parameters on the effects of environmental degradation and climate change.

ZFPI 6243: Ionosphere and Communication in Climate Change (3 Credits; Elective)

The purpose of this course is to provide an understanding of the concept and importance of the ionosphere layer in its effectiveness for long-distance communication. Further discussion covers the importance of the ionosphere as an important medium in the propagation of radio waves and has to do with the changes that occur in solar activity. This focuses on the basic use of techniques and equipment that can be used to monitor these communication systems globally. The use of software will be used in predicting the relationship between two locations for communication using a specific frequency. Basic techniques in determining frequency are needed in ensuring communication can be done well. This course will expose students to the theory of radio wave propagation, ethics in radio communication aynf equipment used in radio communication, and techniques used in communicating using existing equipment.

Prerequisite:

No

Course Requirements to sit for the Examination:

Students must meet 70% of the course requirements which refer to the requirement of lecture attendance, testing or/and submission of assessment assignments during the lecture week excluding final assessment/examination.

References:

Marcel D. C. ON5AU. 2019. Radio waves Propagation – Volume 2. Amazon KDP.

Nicholas M. M. 2017. HF Communications: A System Approach. CRC Press.

Yigit. E. 2017. Atmospheric and Space Sciences: Ionosphere and Plasma Enviroments: Volume 2. Springer.

Barron A. 2016. Software Defined Radio: for Amateur Radio Operators and Shortwave Listeners. Create Space Publishing.

ARRL Inc. 2015. Propagation and Radio Science. The National Asscociation for Amateur Radio.

Course Outcome (CO) / Hasil Pembelajaran Kursus (HPK)

At the end of the course, student should be able to :

HPK1: Ability to study theory and concepts of science and technology in Radio Communication;

HPK2 : Ability to classify and interpret the type of signal radio that is use in radio communication;

HPK3 : Ability to evaluate the issues of science and technology in radio communication using theory and practical;

IX. Course evaluation

- The grading of each semester is for course work and other assessments held throughout the semester and includes a final semester examination for all modes of study.
- The grade and the grade values for coursework will be assessed as follows:

Grade	Grade Value	Status
A	4.00	Pass with distinction
A-	3.67	Pass with distinction
B+	3.33	Pass with merit
B	3.00	Pass with merit
B-	2.67	Pass
C+	2.33	Pass
C	2.00	Pass
C-	1.67	Fail
D	1.00	Fail
E	0.00	Fail
L/K		Pass/Fail (for course without a grade)
TL		Incomplete
U		Audit
TD		Withdraw
SM		In Progress
TP		Deferment
DK		Exempted

The grades without value are as follows:

* L/K (Pass/Fail) grade is given to a student who takes courses that are not given a grade but only given a “Pass” or “Fail”;
* TL (Incomplete) grade is given to a student who is unable to complete the course requirements on reasonable grounds. The student must complete the requirements within the first two (2) weeks after the following semester’s registration to obtain a full assessment and grade;
* SM (In Progress) grade is used for any work or project that exceeds one semester to complete. It is not given any point value, but the units are calculated only for the determination of the general unit for a semester and not for the evaluation purpose required to obtain a degree. The unit and the grade value for the work or project shall be taken into account in calculating the total units for the degree requirement and the average value when the symbol ‘SM’ is substituted with a grade;
* U (Audit) is the grade given to a student who registers, attends a course and takes an examination for a course, but the grade value is not given and the U is only recorded if the student passes the examination of the course. Failure to pass the examination will be recorded as K (Fail);

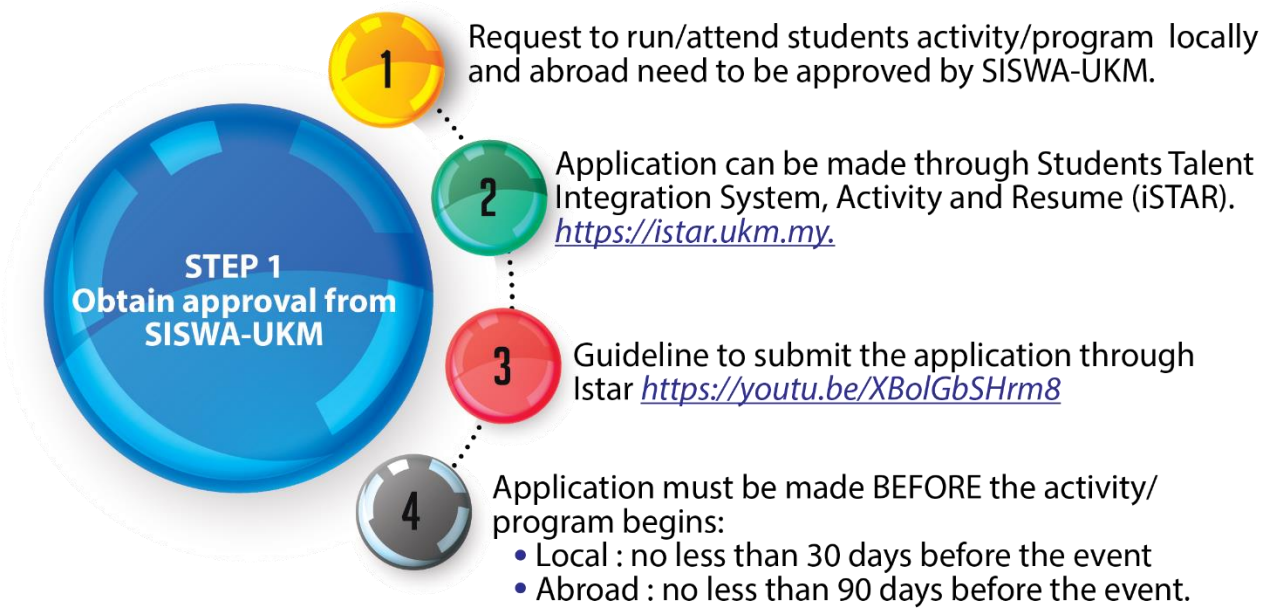
- TD (Withdraw) grade is given to a student who withdraws from a course between the fifth (5) week and the tenth (10) week of the semester with permission from the Dean/Director, subject to regulation 26;
- TP (Deferment) grade is given to a student who applied for postponement of an examination under sub-regulation 44(1). A replacement examination must be held as soon as possible depending on the health state of the student.

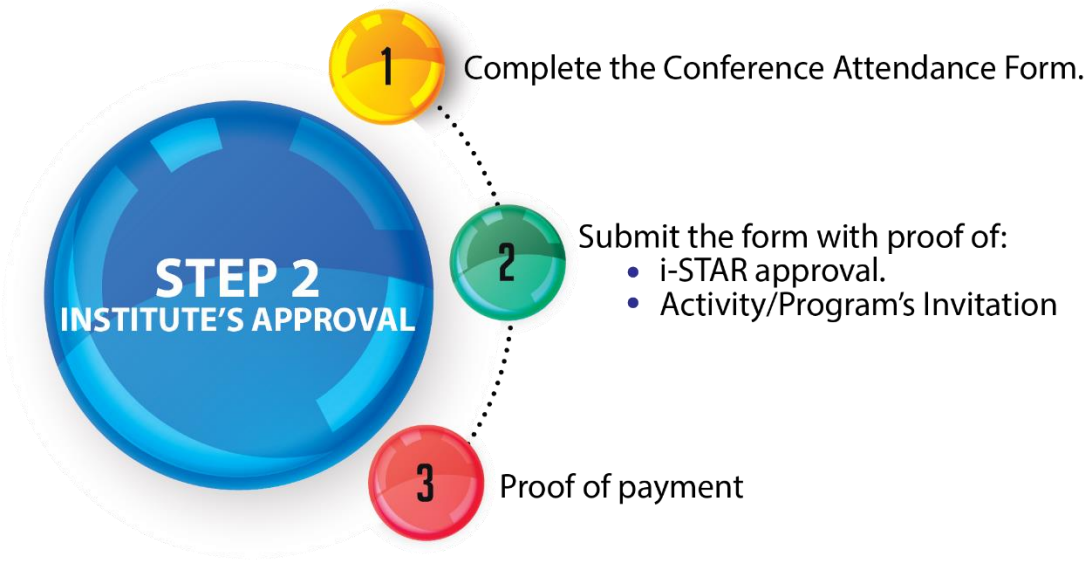
X. Requirements for Degree Conferment

- Fulfil all the requirements of these regulations; and
- Achieve at least a final CGPA of 3.00; and
- Complete the number of credits prescribed by the programme; and
- Fulfil the requirements prescribed by the Faculty/Institute; and
- Fulfil the Bahasa Melayu proficiency requirement for international students as prescribed by the University; and
- Be recommended by the Graduate Examination Committee for Senate approval; and
- Have returned all property of the University; and
- Have settled debts and made all payments prescribed by the University.

13.ISTAR SYSTEM (STUDENT ACTIVITY)

Running/ Attending activities/events





14.GUIDELINES FOR STAFF AND STUDENT ETHICS

Guidelines for Staff Ethics

- Staff are required to recognise that teaching and student supervision are part of their professional obligations.
- Staff are required to be sensitive to student's requirements, recognizing and helping in the student's level of knowledge and experience.
- Staff are obligated to give constructive feedback in a manner, which will improve the student's performance.
- Staff would need to discuss with the Graduate Studies Committee Meeting of any serious concerns about a student's performance and professional capability.
- Staff are required to notify and explain any inability to take a scheduled teaching or meeting session.
- Staff must be able to recognise that any form of persecution is intolerable in IPI.

Guidelines for Students Ethics

- Student are expected to be punctual for all times at IPI prior notifications should be provided if student is unable to attend any scheduled activities at IPI.
- Student are expected to be in a respectable behavior and courteous at all times.
- Students must consult with their supervisor or a third party if there are severe problems such as personal conflicts or high expectations of the students beyond of her/his mentor.
- Ensure the publication ethical issue and research agreements (if any) between the supervisor and students are practiced.

15.HOW TO APPLY AND REGISTER

Prospective candidates can apply directly online at www.join.ukm.my

The flowchart shows the step of the application until the registration process. For further information regarding the Graduate Studies at IPI, please contact:

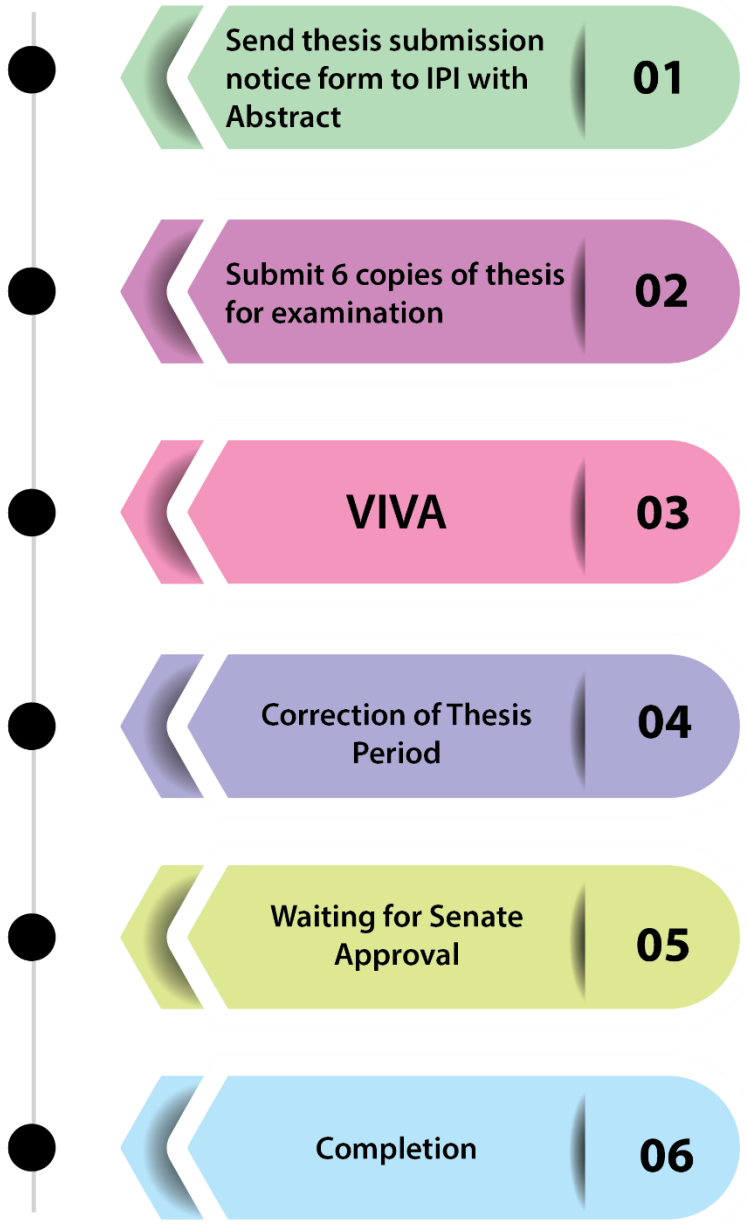
Institute of Climate Change

Universiti Kebangsaan Malaysia
43600 UKM Bangi
Selangor, MALAYSIA

Tel.: (603) 89118033
Email: pghikp@ukm.edu.my

16.PROGRAMME COMPLETION (BY RESEARCH)

Upon approaching of the completion of their study, students need to undergo the following preparation process of graduation:



17.GLOSSARY

ANGKASA	Space Science Centre
ASM	Academy of Science Malaysia
BM	Bahasa Melayu
GPS	Global Positioning System
Graduate	For this book means that for graduate and postgraduate, respectively
GRA	Graduate Research Assistant
IELTS	International English Language Testing System
IPI	Institute of Climate Change
LOI	Letter of Intent
MOU	Memorandum of Understanding
PIK	Centre for Collaborative Innovation (*Pusat Inovasi Kolaboratif*)
PLUS	North-South Highway Project (*Projek Lebuhraya Utara-Selatan*)
PPS	Centre for Graduate Management (*Pusat Pengurusan Siswazah*)
PPU	Centre for General Studies (*Pusat Pengajian Umum*)
R&D	Research and Development
RA	Research Assistant
RF	Radio Frequency
TOEFL	Test of English as a Foreign Language
UKM	Universiti Kebangsaan Malaysia
VLF	Very Low Frequency

18.REFERENCES

1. IPI UKM website, *http://www.ukm.my/ipi*
2. UNIVERSITI KEBANGSAAN MALAYSIA REGULATIONS (GRADUATE STUDIES) 2021, *https://www.ukm.my/jkmfper/wp-content/uploads/2021/12/UKM-Regulations-Graduate-Studies-2021-Book-compressed.pdf*

For more information please contact us:

Administration (HQ)
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Institute of Climate Change (IPI), UKM,
43600 UKM Bangi, Selangor Darul Ehsan, Malaysia.
siswazah_ipi@ukm.edu.my 03-8911 8484/8481 03-8911 8490