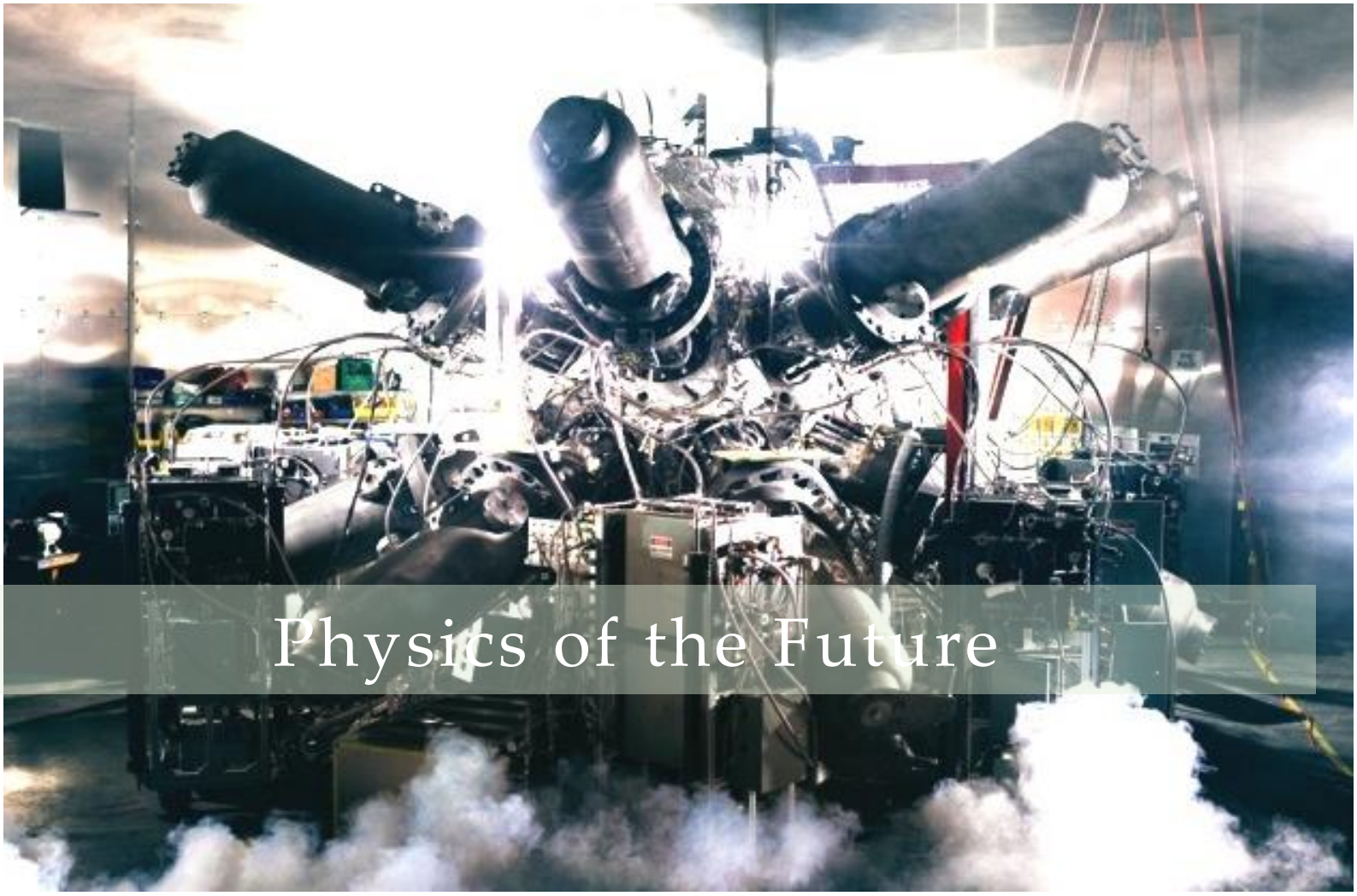
DEPARTMENT OF PHYSICS



DEPARTMENT OF PHYSICS
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DEPARTMENT OF PHYSICS

The Department of Physics in the Faculty of Science, University of Malaya was established in 1961. From the beginning, education in Physics was meant to be a union of theoretical and practical aspects. The Department of Physics, under the current leadership of the Head of Department, Prof. Dr. Hasan Abu Kassim, endeavor to impart a thorough knowledge of the fundamental principles of Physics, as mathematically and experimentally demonstrated to younger generation. Academics and researchers of the Department of Physics are conducting internationally relevant and competitive research, they also collaborate on joint projects with the industry to contribute to the development of knowledge and innovation-based economy, as well as other components of strengthen multidisciplinary and inter-disciplinary research. Their scientific work is connected with innovative teaching techniques, thus providing a creative and stimulating environment for the education of future generations of physicists.

The Department offers two programs leading to Bachelor of Science: Physics Program and Materials Science Program. Our academics are committed to the flexible delivery of learning and teaching methods. Depending on the course, students will enjoy a variety of teaching modes, such as tutorials, problem-based learning, online learning, practical experience and laboratory work. At level three, students will also undergo industrial training and complete a final year project to strengthen the knowledge and skills obtained and adapt to the ever-advancing knowledge in science and technology.

The Department offers graduate study leading to the Master of Science (M.Sc.) and Doctor of Philosophy (Ph.D.). Details are available in the Graduate Program Guidebook of Faculty of Science. Students who graduate with the Bachelor of Science degree from the Department of Physics are encouraged to pursue their studies to the higher degree levels in the field of Physics or other related fields.

Research facilities determine the ways in which nature could be understood. The Department of Physics has a laboratory for centralised facilities to support a wide range of research activities. Major facilities include TEM, FE-SEM, SEM-EDX, XRD, AFM, FT-IR, PL, TLD Reader, OMA, Co-60 irradiator and HPGe Gamma spectrometer, TGA, DSC, DMA, UV-VIS-NIR Spectrometer, Field Emission Auger Microprobe, Flame Hydrolysis Deposition system, Mask Aligner, 1 m grazing incidence Spectrometer, DC sputtering system etc.

ACADEMIC STAFF DIRECTORY

HEAD OF DEPARTMENT:
Prof. Dr. Zurina Osman,
PhD(UM), BSc(UM) (Advanced Materials, Polymeric Materials, Battery)

DISTINGUISHED PROFESSOR:
Datuk Harith Ahmad,
PhD(Wales), MSc(Wales), BSc (UM), FASc (Photonics)

EMERITUS PROFESSOR:
Lee Sing,
PhD(ANU), MSc(UM), BSc(UM) (Plasma Physics)

Wong Chiow San,
PhD(UM), MSc(UM), BSc(UM) (Plasma Devices and Applications)

PROFESSOR:
Hasan Abu Kassim,
PhD(Manc), MSc(Manc), BSc(UM), MIPM (Theoretical Nuclear Physics, Nuclear Astrophysics)

Ramesh T.Subramaniam,
PhD(UM), MTech (Mat. Sc) (UM), BSc (UM), FASc, FRSC, CChem, FMIC, FIMM, FMSA (Polymer Electrolytes, Advanced Materials)

Raymond Ooi Chong Heng,
PhD (Konstanz), MEng(NTU), BSc(USM) (Quantum and Nonlinear Optics, Ultrafast Laser Spectroscopy & Microscopy, Photonic Materials)

Sithi Vinayakam Muniandy,
DPhil(Oxford), MSc(UKM), BSc(Hons)(UKM), (Stochastic Dynamics of Classical and Quantum Systems; Fluctuation and Noises; Fractional Calculus; Complex Systems)

Wan Ahmad Tajuddin Wan Abdullah,
PhD (Lond), DIC, BSc(Lond), ARCS, FIPM (Complex System, Neuron Network, Econophysics, High Energy Particle Physics)

Wan Haliza Abd. Majid,
PhD(Sheffield), MSc(UM), BSc(Aberystwyth), FIPM, (Low Dimensional Materials, Organic Electronics, Advanced Materials)

ASSOCIATE PROFESSOR:
Chew Khian-Hooi,
PhD(USM), BSc(UM) (Condensed Matter and Materials Theory)

Chin Oi Hoong,
PhD(UM), MSc(UM), BSc(UM) (Plasma Physics and Technology)

Jeong Heejeong
PhD (Duke), MSc (SNU), BSc (Soongsil) (AMO and Quantum Optics)

Khaulah @ Che Som Sulaiman,
PhD(UM), MSc(UKM), BSc(UM) (Solar Energy, Organic Electronics)

Ramesh Kasi,
PhD(UM), MS(ANNA), BE(ANNAMALAI) (Corrosion coatings, antifouling coatings, polymer electrolytes)

Siti Rohana Majid,
PhD(UM), BSc(UM) (Polymer Membrane, Advanced Material)

Vengadesh Periasamy,
PhD(UM), MSc(UM), BSc(UM) DNA Electronics, Langmuir-Blodgett, Biophotovoltaics(BPV)

Woon Kai Lin,
PhD(Hull), BSc(Hull) (Carbon based electronics machine learning, applied physics)

Yap Seong Ling,
PhD(UM), MSc(UM), BSc(UM) (Plasma Physics and Technology, Parallel Processes and Innovative Technology)

Zamri Zainal Abidin,
PhD(Manc.),MSc(UM), BSc(UM) (Astrophysics, Cosmology, Radio Astronomy)

Zul Hazrin Zainal Abidin,
PhD(UM), BSc(UM) (Advanced Material, Coatings Technology)

SENIOR LECTURER:
Ahmad Shuhaimi Abu Bakar,
DEng(NITech, Japan), MEng(NITech, Japan), BEng(NITech, Japan) (III-V Nitride Semiconductors, Optoelectronics Fabrication)

Azzuliani Binti Supangat,
PhD (Australia), MSc(UM), BSc(UPM) (semi-conducting polymers, nanomaterials, semiconductor devices)

Chiu Wee Siong,
PhD(Nottingham), MSc(UKM), BSc(UKM) (Magnetic Nanomaterials, Semiconductor Photocatalysis, Materials Characterization)

Chong Wu Yi,
PhD(UM), MSc(UM), BSc(UM) (Laser Physics, Photonic Technology, Optical Sensor)

Goh Boon Tong,
PhD(UM), MSc(UM), BSc(UM) (Semiconductor physics, Inorganic nanomaterials, Optical and x-ray spectroscopies)

Juan Carlos Algaba
PhD(Cork), BSc(Valencia) (Radio Interferometric Observations of Active Galactic Nuclei)

Kanagesan Samikannu
PhD(SRM), MPHILL(ANNA), MSc(Madras), BSc(Madras) (Materials Synthesis and Processing)

Lim Kok Sing,
PhD(UM), BEng(UM) (Fibre Laser, Fibre Optic, Optical Sensor)

Mohd Hamdi Bin Ali,
PhD(UM), *BSc(UM)* (Polymer electrolytes, electrochemical devices)

Mrutunjaya Bhuyan
PhD (SU & IOP), M.Sc. (SU), B.Sc. (Utkal) (Theoretical Nuclear Physics & Astrophysics)

Muhammad Imran Mustafa Bin Abdul Khudus,
PhD(Southampton), MSc(London), BSc(London) (Optoelectronics, Nonlinear Fiber Optics, Photonics)

Nazhatulshima Ahmad,
PhD(UM), MSc(UM), BSc(UM) (Stellar Astrophysics, Moon Crescent, Instrumentation)

Norhasliza Yusof,
PhD(UM), MSc(UM), BSc(UM), (Nuclear astrophysics, Stellar astrophysics)

Nufikri Bin Nor Joharuddeen,
PhD(Oxford), MSc(London), BSc(UM) (Elementary Perticle Physics)

Richard Ritikos,
PhD(UM), MSc(UM), BSc(UM) (Solid State Physics, Material Science, Programing and Instrumentation)

Rozalina Zakaria,
PhD (UK), MSc (UM), Bsc (UPM) (Plasmonics, Laser Physics, Optics, Photonic)

Siti Fairus Abdul Sani,
PhD (Surrey), BSc (Surrey) (Radiation and Medical Physics, Radiation Detection and Measurement, Applied Nuclear and Radiation Physics)

Thamil Selvi Velayutham,
PhD(UM), MSc(UM), BSc(UM) (Material Science, Functional Materials)

Woo Haw Jiunn,
PhD(UM), MSc(UM), BSc(UM) (Polymer Electrolytes, Batteries, Solid State Ionics, relaxation behaviours)

Zarina Aspanut,
DEng(Gifu Univ, Jpn), MEng(Toyohashi Univ of Tech, Jpn), BSc(UM) (Metal-oxide Nanostructures Materials, Semiconductor Devices)

DEGREE PROGRAM

The Department of Physics currently offers two programs at the Bachelor's level, that is, the Bachelor of Science in Physics and Bachelor of Science in Materials Science. List of all the courses offered in this program can be found under the section Structure of Degree of the respective program. Program B.Sc. in Physics consists of three levels, namely Introductory, Intermediate and Advanced levels. The program starts with introductory courses in physics while the Intermediate level builds strong fundamentals in physics through courses such as Quantum Mechanics, Electromagnetism, Mechanics, Mathematical Methods, Statistical Physics, Computation and Numerical Methods, and etc. In the Advanced level, the students have the opportunity to take up courses focussed in various fields. There are eight focus fields that offer various respective elective courses. These are Plasma Physics, Laser and Optoelectronics, Semiconductor Physics, Nuclear Physics and Elementary Particle Physics, Space Physics, Radiation Physics and Biophysics, Physics of Materials and Electronics. Students are also required to carry out a project in any one of these fields. B.Sc.(Materials Science) consists of four levels. The first level gives emphasis on the basic physics necessary for further study of Materials Science. Level two investigates material properties and material characterization methods such as the Mechanical Properties of Materials, Electrical Properties of Materials, Materials Characterization and Magnetic Properties of Superconducting Materials just to name a few. Level three and four consists of course that is more modern, such as Semiconductor Materials and Devices, Nanomaterials and Nanotechnology, Organic Electronic Materials and Devices, Labview Programming, Vacuum and Plasma Technology, Bio-Materials, Electrochemistry, Advanced Materials Processing Technology, Smart Materials, Computational and Simulation, Photonic Materials and devices. Students are also required to carry out the project in one of the fields above. Industry training is compulsory for BSc Program (Materials Science).

At the end of the Degree of Bachelor of Science in Physics program, graduates are able to:

1. Demonstrate proficiency in the basic knowledge in the major fields of physics (classical mechanics, electricity and magnetism, quantum mechanics, statistical mechanics and thermodynamics) and the field of applied physics (e.g. solid state physics, optics, nuclear physics, atomic physics, etc.).
2. Demonstrate practical skills in physics such as designing, setting up experiments, collecting and analyzing data, identifying sources of error, interpreting experimental results and connecting results to related physics concepts or other scientific theories).
3. Value the need for sustainable development in the practice of physics for the needs of society and the environment.
4. Demonstrate capability in seeking creative and practical solutions to meet the requirements and changes dictated by the work environment in a scientific, professional and ethical way.
5. Demonstrate communication, leader-ship and team work skills particularly in relating scientific and technical information through both written and oral presentations.
6. Apply physics principles to novel situations, both in the classroom and in research settings, through critical thinking, problem solving, mathematical and computer modelling, and laboratory experimentation.
7. Manage effectively the rigor and discipline it takes to be a good scientist with efficient time management and appropriate use of resources.
8. Apply their physics experience and knowledge to explore opportunities in entrepreneurship world.

At the end of the Bachelor of Science (Materials Science), graduates are able to:

1. Master the basic knowledge of Materials Science and technology.
2. Apply practical skills in Materials Science and correlate the findings with the concept of Materials Science.
3. Demonstrate skills and social responsibility in the practice of Materials Science
4. Practice of ethics and professionalism as a Materials Scientists
5. Communicate effectively and be able to work independently or in teams
6. Use scientific skills in problem solving related to Materials Science
7. Manage information and personal self development and professional life
8. Using the experience and knowledge of Materials Science to explore opportunities in the world of entrepreneurship.

AREAS OF RESEARCH

There are six research centres in the Department of Physics

1 Centre for Theoretical Physics (CTP)
2 Low Dimensional Materials Research Centre (LDMRC)
3 Centre For Ionics University of Malaya (CIUM)
4 Plasma Technology Research Centre (PTRC)
5 Photonics Research Centre (PRC)
6 Quantum Science Center (QSC)

and sixteen core areas:

1. Applied Materials
2. Space Physics
3. Solid-State Physics
4. Microprocessor and Computational Physics
5. Theoretical Physics
6. Elementary Particle Physics
7. Corrosion and Coatings
8. Magnetic Devices and Instrumentation
9. Applied Optics and High Temperature Density Physics
10. Materials Science and Polymer Physics
11. Applied Radiation
12. Radio astronomy
13. Optical Astronomy
14. Nuclear Physics
15. Nuclear Astrophysics
16. Stellar Astrophysics

Major facilities in the Department of Physics that are primarily used in research of experimental nature are: TEM, FE-SEM, SEM-EDX, XRD, AFM, FT-IR, PL, TLD Reader, OMA, 60Co irradiator and HpGe Gamma spectrometer, TGA, DSC, DMA, UV-VIS-NIR Spectrometer, Field Emission Auger Microprobe, Flame Hydrolysis Deposition system, Mask Aligner, 1 m grazing incidence Spectrometer, DC sputtering system etc.

Other research facilities available in the Department include high speed diagnostic system such as streak camera, fast digital oscilloscope, spectrum analyzers, thin film preparation systems, clean room and gas handling facilities, high-power laser, picosecond laser, high voltage and high current discharge systems, rf ionization plasma sources, pulsed neutron source, high dose radiation source and materials testing laboratory.

Research topics currently active in the Physics Department includes:

1. Studies on polymer electrolyte for lithium air proton batteries.
2. Studies on alkaline solid polymer electrolyte and mechanically alloyed polycrystalline Mg_2Ni for metal hydride-air batteries.
3. Studies on silicone-acrylic paints.

4. Fast pulsed capillary discharge as coherent XUV and soft x-ray source.
5. Digital holography and speckle pattern interferometry.
6. Development and applications of vacuum UV excimer laser and high power industrial CO_2 laser systems.
7. Development of nano-ribbons as thermo luminescence dosimeters.
8. Use of Ge-doped optical fibre as radiation dosimeter.
9. Study of naturally occurring and technically enhanced naturally occurring radioactive materials.
10. Particle production from high-energy electron –proton collision (ZEUS collaboration at the HERA accelerator in DESY, Germany).
11. Study on high Q^2 refraction, resonance and decay of particles.
12. Mechanical studies of polymer based on polyurethane.
13. Design and characterization of super-capacitors.
14. Studies on composite materials.
15. Fabrication of fused couplers, fibre Bragg gratings.
16. Developing optical fibre preform and planar waveguides devices.
17. C-band and L-band erbium-doped fibre amplifiers.
18. Plasma focus as pulsed radiation source.
19. Pulsed exploding wire for syntheses of nanoparticles.
20. RF ICP and AC capacitively coupled plasma sources and applications.
21. Electronic and electro-optical proper-ties of silicon and carbon based materials.
22. Organic light emitting device.
23. Solar devices based on organic semiconducting materials.
24. Astronomical photometry and spectroscopy.
25. Visibility study of a young crescent moon.
26. Adaptive optics.
27. Nuclear reaction rates in astrophysics.
28. Condensed matter physics study of glasses.
29. Stellar and neutrino astrophysics.
30. Experimental Fabrication Techniques in Materials Science.
31. High power ion beam and X-ray source and their application.
32. Design and implementation of neuron networks.
33. Intelligent circuit.
34. IT usage and physics education.
35. Vacuum spark discharge as a EUV source for next generation lithography.
36. Complex dynamics in dusty plasmas.
37. Anomalous transports in disordered materials.
38. Transports phenomena in nanostructures.
39. Quantum Brownian motion.
40. Stochastic field theories using fractional calculus.
41. Description of electroweak interactions of hadrons.
42. Transport mechanism, spectroscopic and morphological studies of gel polymer electrolytes.
43. Studies of ion conducting polymers.
44. Structural and electrical characterization of Langmuir-Blodgett organic thin films of photosynthetic biomaterials (PBMs) reconstituted into “artificial membranes”.
45. Development of biomaterials based nano-gaps, nano-patterning and device fabrication.
46. Algae derived biophotovoltaic studies.
47. Hierarchical nanostructured metal oxide dye sensitized solar cells
48. Low defect density pristine graphene
49. Graphene/metal oxide nanocomposites for solar energy conversion.

50. Magnetic properties of graphene.
51. Construction of noise measurement system for magnetic thin film samples.
52. Description of Electroweak Interactions of Hadrons.
53. Epitaxial growth of III-V nitride-based semiconductors and fabrications of nano-electronic devices.
54. Gravitational field around Galaxies, Stars and Planets with Elliptical shape.
55. Femtosecond Laser Science.
56. DNA electronics research to enable detection of DNA base pairs conductivity to enable genomic sequencing, detection of blood borne pathogens etc.
57. Preparation of graphene thin film for application as anodes for fuel cells and as transparent conductive film using the Langmuir-Blodgett method.
58. Research into the antipathogenic/anticancer properties of riboflavin.
59. Preparation of inorganic nanoparticles (Ag, Au etc) through the normal and green synthesis process and its antimicrobial/anticancer properties.
60. Biophotovoltaic (BPV) fuel cell research in production of green energy.

JOB OPPORTUNITIES

Courses offered in the Department of Physics, University of Malaya are suited for those who wish to be scientists and professional technologists in research institutions and the industries. Physicists are in high demand especially those who are trained in the field of new and advanced materials, device fabrication, nano-technology, testing and measurements. The industrial sector and research institution today need physicists who are able to integrate new and advanced technology into existing system. Physics graduates are highly sought after in the electronics industries, space industry, computer and information technology as well as telecommunication, and various electrical and mechanical manufacturing industries. They often serve as materials process engineers, quality control engineers in the production division or researchers in the division of research and development (R&D). Many Physics graduates have also made excellent marketing and sale executives for modern, sophisticated scientific equipment.

Other opportunities include those in the medical field. Laser technology, x-ray, NMR, radiation and ultra sound are commonly used in various medical fields, hence, Physics graduates are suited to assist the medical officers in the operation and management of these systems as well as in data analysis.

There is great opportunity for Physics graduates to become academicians and researchers in Institutions of Higher Learning upon furthering their studies to the PhD level. Besides, Physics lecturers and teachers are also in high demand in schools, as well as public and private colleges.

POST-GRADUATE DEGREE (FIELDS OF RESEARCH)

Post-graduate candidates may pursue the MSc and PhD programs (by research) in various areas such as Plasma Physics, Laser Physics, Photonics, Semiconductor Physics and Devices, Display Devices, Thin Film Technology, Materials Science, Polymer Physics, Conducting Polymer, Environmental Radiation, Neuron Network, Complex Systems, Elementary Particle Physics, Nuclear Theory, Condensed Matter Theory, Space Physics, Astronomy and Cosmology and Stellar Astrophysics.

The Department of Physics also offers MSc (Applied Physics) and MTech (Materials Science) programs by course work covering areas in Semiconductor Technology, Plasma Technology, Laser and Optoelectronics, Applied Radiation and Materials Science.