

CURRICULUM VITAE (CV) (March 23, 2011)General Information

Name: MOUSA MOHAMMAD ABDUL-GADER JAFAR (B.Sc., M. Sc., and Ph. D. in Physics)

Field of Specialism: Physics

Sub-Specialism field: Experimental Solid State Physics

Electrical, dielectric, optical, and structural characterization of semi-conducting and dielectric materials

Permanent Work Address

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Higher Education

- B. Sc. Physics (July 1, 1971; University of Jordan, Amman, Jordan)
- M. Sc. Physics (November 8, 1975; Heriot-Watt University, Edinburgh, U. K.)
- Ph. D. Physics (June 20, 1984; University of London, London, U. K.)

Academic ranks/positions (February 21, 1976-till present)

- Full-time Lecturer (21/2/76-21/2/78; Physics Department, University of Jordan, Amman, Jordan)
- Full-time Lecturer (19/3/79-15/9/80; Physics Department, University of Jordan, Amman, Jordan)
- Senior Lecturer (5/8/84-4/8/88; Physics Department, University of Jordan, Amman, Jordan)
- Assistant Professor B (5/8/88-26/8/89; Physics Department, University of Jordan, Amman, Jordan)
- Assistant Professor A (27/8/89-31/3/90; Physics Department, University of Jordan, Amman, Jordan)
- Associate Professor B (1/4/90-17/5/98; Physics Department, University of Jordan, Amman, Jordan)
- Associate Professor A (18/5/98-6/7/03; Physics Department, University of Jordan, Amman, Jordan)
- Part-time lecturer (Associate Professor) (1st & 2nd Semesters 91/92; Department of Mathematics and Computer Science, Amman Private University, Amman, Jordan)
- Associate Professor (3/9/94-1/9/95; 1st sabbatical leave of absence; Department of Physics, Applied Science Private University, Amman, Jordan)
- Lecturer D (Associate Professor) (6/9/97-4/9/98; 2nd sabbatical leave of absence; Physics Departments of Sur and Suhar Teachers' Colleges of Education, Sur and Suhar, Sultanate of Oman)
- Full Professor (July 07, 2003- ; Physics Department, University of Jordan, Amman, Jordan)
- Part-time lecturer (Professor) (2nd Semester 2003/2004; Department of Basic Sciences, Faculty of Science, Philadepia University, Jarash, Jordan)
- Full-time academic staff (Professor) (20/9/2004 - 20/9/2005; Sabbatical Leave in the Department of Basic Sciences, Faculty of Engineering Technology, Al Ba'iga Applied University, Amman, Jordan)

Academic Experience and Research

Period I: 5/8/1984 - until now (staff member in the Physics Department of the University of Jordan)

I-A: Research activities

- **Electrical, dielectric, structural, and optical properties of semiconducting/dielectric substances**

a) Anthracene: Supervising (joint) an M. Sc. student (Department of Physics of the University of Jordan, 86/87) who did work on electrical properties of organic anthracene compound

b) $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$ - thin films: Studying electron transport in thin films of the II-VI $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$ compounds at various temperatures (300-4.2 K) under different DC magnetic fields (0 - 40 kG) during summer 88/89 at the Royal Holloway & Bedford New College of the University of London (UK)

c) PAN-based carbon fibers: Working on electrical measurements on PAN-based carbon fibers to gain a clue to the actual conduction mechanisms occurring in this material

d) Mercuric Iodide (HgI_2) single crystals: Studying electrical properties of HgI_2 single crystals such as photoconductivity, dielectric constant and AC impedance (10Hz-15 kHz) at different temperatures (50-320 K) and visible-light intensities

e) Pb_2CrO_5 ceramics and films: Working (with Professor Kohji Toda, Japan) on electrical, dielectric, photoconductive properties, and AC-impedance of Pb_2CrO_5 material (in ceramic/annealed thin-film forms).

f) Selenium (Se) films: Studying DC and AC properties of thermally evaporated and CBD films of elemental selenium (Se) such as current-voltage (I-V) characteristics, structural properties, AC-impedance, and photoconductive properties as a function of visible-light intensity, externally applied voltage, film-thickness, temperature, frequency and heat-treatment conditions

g) Glass-forming systems (e.g., glycerol): Studying (with Professor R. R. Nigmatullin (Kazan State University) and Dr. Naoki Shinyashiki (Tokai University, Japan) in 1999-2001) dielectric behavior of glycerol over a broad frequency range (10^{-3} - 10^6 Hz) and a wide temperature region (180-410 K)

h) Electron transport in a two-dimensional (2D) electron gas: Investigating (with Professor M. J. Lea (Royal Holloway & Bedford New College of the University of London, UK) in 88/89-summer) the conductivity tensors for a 2D-electron gas localized on the surface of liquid helium as a function of temperature (> 0.5 K) and of magnetic field (< 70 kG) at various frequencies)

i) PN junctions: Supervising two M. Sc. students who got their degrees in 2006 on electrical and optical properties of the metal/ZnO junction prepared by sol-gel spin-/dip- coating and SILAR deposition methods
Studying also (with Dr. A. Al Omari, JUST) the current-voltage (I-V) characteristics of BC/p-Si junctions as a function of temperature (100-300 K) of PN junctions of boron carbide (BC)/c-Si

j) Lead Iodide (PbI_2) single crystals and films: Investigating (with Prof. Mahmoud Hassan (Princess Summaya University of Technology, Jordan), Dr. Marie Matuchova and Dr. Karel Zdansky, both at Institute of Electronics and Photonic, in Prague, Czech Republic) electrical, dielectric, and optical properties of PbI_2 single crystals
Supervising (with Dr. Basim Bulos) a Ph. D. student working on the structural, electrical and optical properties of flash-evaporated thin films of PbI_2

I-B: Teaching and educational activities

- **Department of Physics of University of Jordan (Amman, Jordan)**

Teaching, since 1984- till now, the following undergraduate and postgraduate physics courses

1. General Physics 107, 103 and 105 for freshman students of agriculture and medical faculties
2. General Physics 101 and 102 for the Physics, Science and Engineering freshman students
3. Undergraduate and postgraduate Classical Mechanics
4. Undergraduate Electromagnetic Theory (EM I & II)
5. Undergraduate Quantum Mechanics
6. Undergraduate and postgraduate Mathematical Physics (I & II)
7. Undergraduate Optics (I & II)
8. Statistical Mechanics for undergraduate and postgraduate students
9. Special Topics (Semiconductor Theory and Applications) for postgraduate students
10. Solid-State Physics for undergraduate and postgraduate students
11. Methods in Experimental Physics for postgraduate students
12. Condensed Matter Physics for Ph. D. Students
13. Physics Seminars and B. Sc. Projects in physics
14. All the General (freshman), Intermediate, and Advanced Laboratories of Physics
15. M. Sc. and Ph. D. Advanced Classical Electrodynamics I & II (Jackson's, Greiner's and Melia's Books)

- **Department of Mathematics and Computer Science of Amman Private University (Amman, Jordan)**

As a part-time lecturer in the 1st & 2nd semesters of the academic year 91/92, I taught general-physics courses and laboratories for Computer Science freshmen students of Amman Private University (Jordan)

- **Department of Physics of Applied Science University (Amman, Jordan)**

In the year 94/95 (1st sabbatical leave of absence from UJ), I joined Physics Department of the Private Applied Science University (Jordan), where I taught several freshmen/intermediate courses and Senior/Junior courses and laboratories for pure/medical physics students.

- **Departments of Physics of Sur & Suhar Teachers' Colleges of Education (Sur/Suhar, Oman)**

During the sabbatical year 97/98, I worked as a lecturer (rank D: Associate Professor) in physics Departments of both Sur and Suhar Teachers' Colleges of Education (Sultanate of Oman), where I taught physics courses for their freshmen and advanced undergraduate students. I also supervised many physics students of Sur College during their training courses at high secondary schools.

- **Department of Basic Sciences, faculty of Science of Philadelphia University (Jarash, Jordan)**

As a part-time lecturer in 2nd semester of 2003/2004, I taught general-physics course for freshmen students of Basic Sciences in Private Philadelphia University (Jordan).

- **Basic Sciences Department, Faculty of Engineering Technology (Al-Ba'Iga Applied Univ., Jordan)**

During the academic year 2004/2005 (my 3rd sabbatical year) I worked as a full-time academic staff (Professor) in Department of Basic Sciences, Faculty of Engineering Technology (Al-Ba'Iga Applied University, Jordan). I taught freshmen Physics courses for engineering students. I was also the head of a promotional committee in this Department. I was a member of the college's promotion and research committees.

I-C: Supervision of M. Sc. and Ph. D. Students

Supervising (main/joint) many M. Sc. students in the Department of Physics of the University of Jordan since 1986 who did work on structural, electrical and optical properties of several semiconducting materials (e.g., Se, ZnO, PbI₂)

I-D: Activities and contributions in scientific conferences

(i) A member of the organizing committees of several conferences/Schools held in University of Jordan (UJ), Amman, Jordan (1986, 1989, 1993, 2000)

(ii) Attending and/or participating as a referee and/or with an oral talk (published and unpublished articles) in many Local, Regional, or International conferences, workshops, symposia, and scientific activities (1986 - 2010)

I-E: Other General Activities

A member/coordinator in many educational and examination committees (local and regional), co-author for several intermediate laboratory manual books, as well as a referee for several tens of scientific papers in the field of Solid State Physics and related topics for local and regional, and international scientific journals

Period II: Oct.80-June 84 (Ph. D. student at Bedford College, University of London, London, UK)

I completed my Ph. D. degree in physics at Bedford College of University of London (1980-1984), where I also participated in teaching physics laboratory to freshman students. I got experience in two areas:

II-A: Metal-Insulator (M-I) transition and electrical properties of n-InSb crystals

I did detailed measurements on DC electrical magnetoresistivity (longitudinal and transverse) and Hall Effect of relatively highly doped n-type InSb crystals in the temperature range 4.2-0.03 K under high DC magnetic fields (< 70 kG) Magnetic Tuning Metal-Insulator (M-I) Transition had been observed in those n-InSb samples in analogous to the pressure-induced M-I transition in Si and Ge. The title of my Ph. D. thesis is:

"Studies Related to the Magnetic Field Induced Metal- Insulator Transition in n-type InSb".

II-B: Low and ultra-low temperature techniques

I got experience with the methods of obtaining/measuring low and ultra-low temperatures, leak-detection systems, superconducting magnets, various cryogenic liquids (N₂, ⁴He and ³He), and ³He-sorption cryostats and ³He-⁴He dilution refrigerators and their operation.

Period III: 21/2/76-15/9/80 (full-time lecturer in Physics Department, Jordan University, Amman)**III-A: Teaching activities**

I worked as a full-time lecturer in the Physics Department of The University of Jordan

III-B: Research Activities

I did research work (with Dr. R. N. Bitar) on construction of an AC-impedance technique and a cold-finger crystal growing apparatus and on electrical properties of PVC membranes using such apparatus.

Period IV: In 74-75 (M.Sc. student in Physics Department, Heriot-Watt Univ., Edinburgh, Scotland)

I was a full-time research M.Sc. student in the year 1974-1975 in Physics Department of Heriot-Watt University. I constructed a stellar magnetograph using electrically scanned Fabry-Pérot interferometer, with the aim to mount it on a Cassegrainian/Newtonian telescope to measure magnetic fields of prominent magnetic stars. I carried out laboratory simulation using artificial light. My M. Sc. thesis is entitled:

"A Design Study of Piezo-Electrically Scanned Fabry-Pérot Stellar Magnetograph".

Period V: Sept.72-Oct.73 (M. Sc. student at Physics Department of University of Cairo, Egypt)

I was a full-time M. Sc. student in Physics Department of University of Cairo, where I completed several Post-graduate courses with a grade of 3.6/4.0. I was involved in studying Mossbauer Effect in some Fe and Mn compounds, but I left Cairo University for Heriot-Watt University (Scotland).

Period VI: Sept.71-Aug.72 (teacher in high secondary Schools, Ministry of Education, Amman, Jordan)

I worked as a physics teacher in high secondary schools of Jordanian Ministry of Education.

Period VII: Oct.67-July 71 (B. Sc. student in Physics Department, University of Jordan, Amman, Jordan)

I was a full-time B. Sc. student at Physics Department of University of Jordan (UJ), from which I got my B.Sc. degree in physics with an average grade of "excellent". During my third and fourth years, I worked as a teaching instructor for some general/intermediate physics laboratories of the Physics Department of UJ.

LIST OF PUBLICATIONS (Theses, Journals' Articles, Conferences' Articles)

Theses of Higher studies in Physics

- **M. Sc. Thesis** (November 1975; Heriot-Watt University, Edinburgh, Scotland)
Title: "*A design Study of a Piezoelectrically Scanned Fabry-Pe'rot Stellar Magnetograph*".
- **Ph. D. Thesis** (June 1984; University of London, London, United Kingdom)
Title: "*Studies Related to the Magnetic Field Induced Metal- Insulator Transition in n-type InSb*".

Journals' Articles

- 1) "*Impedance Behavior of PVC (Poly Vinylchloride) matrix ion- selective electrodes*" by R.N. Ahmad-Bitar, M. M. Abdul- Gader, A. M. Zihlif, and A. M. Jaber: *J. Electronal. Chem.* 143, 121 (1983)
- 2) "*Magnetic Tuning of the Metal-Insulator transition in n-InSb at very low temperatures*" by R. Mansfield, M. M. Abdul-Gader, and P. Fozooni: *Solid State Electr.* 28, 109 (1985)
- 3) "*The Application of ac-impedance Methods to HgI₂ Crystals*" by R. N. Ahmad-Bitar, M. M. Abdul-Gader, K. A.Wishah, Y. A. Mahmud and M. A. Hassan: *Nuclear Instr. and Methods in Phys. Research,* A243, 505 (1986)
- 4) "*Ac Electrical Behavior of Mercuric Iodide under Different Light Intensities*" by M. M. Abdul-Gader, K. A. Wishah, R. N. Ahmad-Bitar, Y. A. Mahmud, and M. AL-Haj Abdallah: *Egypt. J. Solids* 8, No.2, 40 (1986)
- 5) "*Activation Energy of HgI₂ crystals*" by R. N. Ahmad-Bitar, Y. A. Mahmud, K. A. Wishah, M. M. Abdul-Gader, and M. Al-Haj Abdallah: *Egypt. J. Solids* 8, No. 2, 33 (1986)
- 6) "*Impedance Behavior and the Temperature Dependence of Resistivity of PAN-Based Carbon Fibers*" by M. M. Abdul-Gader, M. S. Ahmad, R. N. Ahmad-Bitar, and A. M. Zihlif: *Egypt. J. Solids* 8, No.1, 88 (1986)
- 7) "*Temperature Dependence of Dielectric Behavior of illuminated HgI₂*" by K. A. Wishah, Y. A. Mahmud, M. M. Abdul-Gader, M. Al-Haj Abdallah, and R. N. Ahmad-Bitar: *Appl. Phys.* A43, 61 (1987)
- 8) "*Temperature Dependence of ac-Photoconductivity of HgI₂ Crystal*" by Y. A. Mahmud, K. A. Wishah, M. M. Abdul-Gader, M. Al-Haj Abdallah and R. N. Ahmad-Bitar: *Appl. Phys:* A42, 129 (1987)
- 9) "*High Field Electrical Conduction in HgI₂*" by M. M. Abdul- Gader, K. A. Wishah, Y. A. Mahmud and R. N. Ahmad-Bitar: *J. Mater. Sci.* 22, 2203 (1987)
- 10) "*Effect of Visible Light Intensity on the Dielectric Behavior of Mercuric Iodide*" by M. M. Abdul-Gader, K. A. Wishah, Y. A. Mahmud, M. Al-Haj Abdallah, and R. N. Ahmad- Bitar: *Appl. Phys.* A42, 123 (1987)
- 11) "*Magnetoresistance of 2D-electrons on Helium at 0.5K*" by A. O. Stone, P. Fozooni, M. J. Lea, and M. M. Abdul-Gader: *J. Phys. CM.,* 2743 (1989)
- 12) "*Evidence of Space-Charge Conduction in HgI₂ Crystal*" by R. N. Ahmad-Bitar, M. AL-Haj Abdallah, M. M. Abdul-Gader, Y. A. Mahmud, and K. A. Wishah: *J. Appl. Phys.* 63, 2686 (1988)
- 13) "*AC Electrical Behavior of Pb₂CrO₅ ceramic Sample with Surface Electrodes*" by M. M. Abdul-Gader, K. A. Wishah, Y. A. Mahmud, K. Toda, and R. N. Ahmad-Bitar: *Appl. Phys.* A49, 665 (1989)
- 14) "*Electrical Transport Properties of Hg_{0.7}Cd_{0.3}Te*" by M. M. Abdul-Gader, S. Abboudy, S. N. Ershov, and T. Parker: *Internal Report at the International Center of theoretical Physics (ICTP), Miramare-Trieste (Italy), No. IC/88/309 (September. 1988)*
- 15) "*Light Induced Electrical Inhomogeneity in HgI₂ Crystal*" by R. N. Ahmad-Bitar, S. J. Khomayes, K. A. Wishah, M. M. Abdul-Gader, and Y. A. Mahmud: *Dirasat (Pure and Applied Sciences)* 21B, 41 (1994)
- 16) "*dc I-V Characteristics and steady-state Photoconductivity of Au/Pb₂CrO₅/SnO₂ sandwich-structure films under illumination in the visible region*" by M. M. Abdul-Gader and K. A. Wishah: *J. Mater. Sci.* 32, 1269 (1997)

- 17) "Loss-tangent and Dispersion Behavior of unbiased HgI_2 crystals under dark conditions" by M. M. Abdul-Gader, K. A. Wishah, and Y. A. Mahmud: *Dirasat (Natural and Engineering Sciences)* 25, 275 (1998)
- 18) "Impedance analysis of the ac Behavior of an $Au/Pb_2CrO_5/SnO_2$ sandwich-structure thin-film device" by Kohji Toda, M. M. Abdul-Gader, and Masahiko Okada: *J. Phys.: Condens. Matter* 9, 3609 (1997)
- 19) "Anomalous Effect of dc high Electric Fields on the Dielectric Dispersion of HgI_2 crystals" by Y. A. Mahmud, K. A. Wishah, M. M. Abdul-Gader, S. J. Khomayes, S. Musameh, and R. N. Ahmad-Bitar: *Mu'ta Journal for Research and Studies* 11, 105 (1996)
- 20) "Photoconduction and Polarization effects in a heat-treated $Au/Pb_2CrO_5/SnO_2$ film device" by K. A. Wishah and M. M. Abdul-Gader: *Appl. Phys. A* 66, 229 (1998)
- 21) "ac-Impedance Behaviour and dc I-V Characteristics of an annealed Pb_2CrO_5 Film Device with interdigital pattern of coplanar Au-electrodes" by M. M. Abdul-Gader, Masahiko Okada, and Kohji Toda: *Lebanese Scientific Research Reports* 2, 1093 (1997)
- 22) "Temperature Dependence of DC Conductivity of as-deposited and annealed Selenium films" by M. M. Abdul-Gader, Mahmud A. Al-Basha, and K. A. Wishah: *Int. J. Electronics* 85, 21 (1998)
- 23) "Low-field current transport mechanisms in rf magnetron sputter deposited boron carbide (B_5C)/p-type crystalline silicon junctions in the dark" by M. M. Abdul-Gader, U. A. Al-Bini, Ahmad A. Ahmad, and M. A. Al-Basha: *Int. J. Electronics* 88, 873 (2001)
- 24) "Identification of a new function model for the AC-impedance of thermally evaporated undoped selenium films using the Eigen-coordinates method" by M. M. Abdul-Gader and R. R. Nigmatullin: *Thin Solid Films* 396, 280 (2001)
- 25) "Recognition of a new permittivity function for glycerol by the use of the eigen-coordinates method" by R. R. Nigmatullin, M. M. Abdul-Gader Jafar, Naoki Shinyashiki, Seiichi Sudo, and Shin Yagihara: *Journal of Non-Crystalline Solids* 305, 96 (2002)
- 26) "High-field current-voltage-temperature characteristics of undoped rf magnetron sputter deposited boron carbide (B_5C)/p-type crystalline silicon heterojunctions" by M. M. Abdul-Gader Jafar: *Semcond. Sci Technol.* 18, 7 (2003)
- 27) "Frequency dependence of loss tangent of thermally annealed undoped lead iodide crystals in the dark" by Mahmoud A. Hassan and Mousa M. Abdul-Gader Jafar: *Nuclear Instruments and Methods in Physics Research A* 566, 526 (2006)
- 28) "Effect of isothermal annealing and visibl-light illumination on the Ac-impednce behavior of undoped selenium thin films" by I. F. Al-Hamarneh, B. R. Bulos, and M. M. Abdul-Gader Jafar: *Journal of Non-Crystalline Solids*, 355, 229 (2009)
- 29) "Inflence of doping and non-stoichiometry on the quality of lead iodide for use in X-ray detection" by Marie Matuchova, K. Zdansky, J. Zavadil, J. Tonn, M. M. Abdul-Gader Jafar, A. N. Danilewski, A. Croll, and J. Maixner, *Journal of Crystal Growth*, 312, 1233 (2010)
- 30) "An Experimental Evidence of some Lead Iodide Polytypes Compatible with the Dielectric Functions Model" by Mahmoud A. Hassan, Mousa M. Jafar, Marie Matuchova, and Basim N. Bulos: *Journal of Applied Sciences*, 10 (24), 3367 (2010)"

- **Articles read at Conferences**

- 1) "AC Electrical Behaviour of Mercuric Iodide under Different Light Intensities" by M. M. Abdul-Gader, K. A. Wishah, R. N. Ahmad-Bitar, Y. A. Mahmud, and M. Al-Haj Abdallah in the 9th International Conf. Solid State Phys., Santa Cathrene, Sinai, (7-11 April, 1986)
- 2) "Electron Transport in the Magnetically Induced M-I Transition in $InSb$ " by M. M. Abdul-Gader, R. Mansfield, and P. Fozooni in the Proceedings of the International. Conf. on High Magnetic Fields in Semicond. Physics (Wurzberg, Germany, August 18-22 (1986): Vol.71 Springer-Verlag Series in Solid State Physics (1987)
- 3) "Temperature Dependence of the Bulk Resistance of unilluminated HgI_2 Crystal" by M. M. Abdul-Gader, R. N. Ahmad-Bitar, M. Al-Haj Abdallah, Y. A. Mahmud, and K. A. Wishah in the Second

International Conf. on Shallow Impurity Centers, Trieste, Italy (28th July -1st August, 1986), which appeared also as an Internal Report 1C/86/230 at ICTP-Miramare, Trieste, Italy

- 4) "*ac-Impedance Behaviour and dc I-V Characteristics of an annealed Pb₂CrO₅ Film Device with interdigital pattern of coplanar Au-electrodes*" by M. M. Abdul-Gader, Masahiko Okada, and Kohji Toda (given as an oral talk at the Ist French-Lebanese Conference on Material Sciences, which has been held in Beirut, Lebanon on 9-12 Oct., 1996). This article has been published in a special issue of the Lebanese Scientific Research Reports 2, #3, (Dec. 1997) 1093.
- 5) "*Electrical Properties of Boron Carbide (B₅C)/Silicon Diodes*" by M. M. Abdul-Gader, U. A. Al-Bini, Ahmad A. Ahmad, and N. J. Ianno, which was just read as a short oral talk in the 2nd Workshop in Physics: Properties and Applications of Thin Films (held in Al Al-Bayt University, Mafraq, Jordan, 10-11 May, 1999)
- 6) "*Identification of a new AC-impedance Function in Selenium Films by the Eigen-Coordinates Method*" by M. M. Abdul-Gader and R. R. Nigmatullin. An oral talk was only given at the 6th International Conference of Dielectric and Related Phenomena (DRP 2000) held in Spala (Poland, 6-10 September, 2000)
- 7) "*AC-impedance of an undoped Lead Iodide Single Crystal Prepared From Polycrystalline Ingot Synthesized With 10% Excess of Iodine*" by Mousa M. Abdul-Gader Jafar, Mahmoud A. Hassan, Ibrahim F. Al-Hamarneh, and Marie Matuchova: WSEAS-Houston Conference (April 30th-May 2nd, 2009)
- 8) "*An Experimental Evidence of some Lead Iodide Polytypes Compatible with the Dielectric Functions model*, by Mahmoud A. Hassan, Mousa M. Jafar, Marie Matuchova, and Basim N. Bulos: 24th Symposium of Malaysian Chemical Engineers and 1st Conference on Process Engineering and Advanced Materials (ICPEAM2010), organized by University Teknologi Petronas, Kuala Lumpur, Malaysia, June 15-17, 2010

- **Books and Manuals**

1. "*Advanced Experimental Physics-2 (411)*" by M. M. Abdul-Gader, R. N. Ahmad-Bitar, B. R. Bulos, Abdelnour Hindeleh, Y. A. Mahmud, and A. Wriekat, Editor R. Ahmad-Bitar (The University of Jordan Printing Press, Amman, Jordan, 1987)
2. "*Advanced Experimental Physics- 1 (311)*" by M. M. Abdul-Gader, R. N. Ahmad-Bitar, A. M. Hindeleh, and A. A. Wriekat (The University of Jordan Printing Press, Amman, Jordan, 1991)
3. "*Intermediate Experimental Physics (1)*" by M. M. Abdul-Gader and K. A. Wishah (Al-Quds Open University Publications, Amman, Jordan, 1st edn 2002)