



**Agreement of Cooperation
Between
Vel Tech Dr. RR & Dr. SR Technical University, Avadi, Chennai, India
And
Department of Mechanical Engineering,
National Cheng Kung University, Tainan City, Taiwan**

The objective of the present Agreement is to develop academic cooperation between Vel Tech Dr. RR & Dr. SR Technical University (hereinafter referred to as Vel Tech) and Department of Mechanical Engineering, NCKU (hereinafter referred to as DME, NCKU).

Vel Tech and Department of Mechanical Engineering, NCKU are at present willing to establish academic links and contacts in the area of "Exchange of Students" between the two Institutions. The program may be extended to other Departments later by mutual agreement.

1.0 Student Exchange Program

1.1 Understanding of Terms

"Exchange Period" is defined as either one academic semester or equivalent period in which the student is registered.

"Exchange Student" is one who participates in the Exchange Program between the two Institutions and is required to pay tuition fees at the Home Institution only.

The "Home Institution" is the Institution in which the student is originally enrolled. The "Host Institution" is the Institution to which the exchange student is attached for the duration of Exchange Period.

1.2 General terms and Conditions

1.2.1 The Student Exchange Program is founded on the basis of mutual reciprocity, with the intention of achieving a maximum of 4 (four) Exchange Students each way for every year. The duration of Exchange (Exchange Period) for Undergraduate students will be 4 to 6 months and for Masters students will be 6 to 9 months. However before each Exchange, the Period will be mutually agreed upon between Vel Tech and DME, NCKU. Proposals for Exchange Students must be made in advance and agreed upon with sufficient notice to both parties. However there is no obligation on either Institution to nominate students for the Program.

1.2.2 The Home Institution will be responsible for screening and selecting students for this program, subject to acceptance by the Host Institution. The Host institution may at its discretion reject any applicant whose academic or other qualifications for participation in the program are not found to be appropriate.

1.2.3 Participating Exchange Students will continue as candidates for degrees at their Home Institution and will not be candidates for degrees at the Host institution.

1.2.4 Exchange Students will be subject to the academic rules and discipline of the Host Institution. Where applicable, the Host Institution will periodically inform the Home Institution of the academic progress of the participants in the program.

1.2.5 Round trip international travels, cost of room and board and all personal costs in the host country are the personal responsibility of each student. The Host Institution will make reasonable efforts to assist the Exchange Student to obtain housing and with other matters of hospitality, but is not obliged to provide housing or financial assistance of any kind whatsoever. However Host Institution will render advise on possible scholarships/financial support options available for such programs.

1.2.6 Exchange Students shall be responsible for obtaining their own visas and completing the required immigration formalities, and for obtaining the travel and other related documents needed to pursue studies at the Host Institution. However the Host Institution shall provide necessary support documentation like invitation/admission letters for obtaining visa.

1.2.7 If the Exchange Student voluntarily withdraws before the end of his/her program of study, it will be considered a completed exchange.

1.2.8 No monetary consideration will be exchanged between the two institutions. The host institution will waive all application, academic and administration fees normally required from international students.

1.2.9 The following modes of operation are possible under this Agreement:

[a] An Exchange Student pursuing his/her Undergraduate course from the Home Institution will undertake to do one semester course work or do his/her Major Project at the Host Institution during the final year of the Undergraduate Program.

[b] An Exchange Student pursuing his/her Masters from the Home Institution will undertake to do his/her Major Thesis at the Host Institution.

[c] The credits which are obtained in the Host Institution are transferred to Home institution to complete the total required credits for the degree.

[d] The language of instruction on both sides will be English.

1.3 Student Enrollment and Assessment

1.3.1 Exchange Students will be permitted to enroll in any course of the Program offered by the Host Institution, subject to admission requirements, time table and capacity constraints of the Host Institution. The students of Vel Tech will be from Aeronautical or Mechanical Engineering disciplines, and the students of NCKU will be from Department of Mechanical Engineering.

1.3.2 Each Exchange Student will be required to fulfill the requirements of the proposed academic program that has been agreed in advance by the two institutions.

1.3.3 Exchange Students will obtain credits for the courses and experience in accordance with the regulations of the Home Institution. Official transcripts for each student will be sent directly to the Home Institution at the end of the program.

2.0 FACULTY EXCHANGE PROGRAM

2.1 Exchange of Faculty.

The two universities may nominate their faculty members to participate in an exchange for the purpose of study or lecturing in the other university on a reciprocal basis. The participation is subject to approval by the host university. The period of exchange will normally be one or two semesters. The host university will provide a university affiliation, library and research facilities, and other assistance as far as possible. The host university will assist the visiting academic staff in locating suitable accommodation.

2.2 Visiting Faculty.

In addition to the reciprocal exchanges, either university may invite faculty members of the other university for the purpose of lecturing or consultation for a specified period of time, subject to the approval of the home university. In such cases the inviting university makes appropriate funding arrangements agreed to in advance.

2.3 Visiting Research Fellows.

Either university may nominate one or more of its faculty to visit the other university for the purpose of advanced study or research, subject to the approval of the host university. The host university will provide institutional courtesies, library and research facilities and an appropriate affiliation.

3.0 COOPERATIVE RESEARCH

Co-operative research is to be encouraged as individual scholars or departments establish contact and develop mutual interests. The cost and conditions of such agreements will be negotiated individually.

4.0 EXCHANGE OF ACADEMIC MATERIALS

Each university shall encourage exchange of all relevant materials, such as those relating to the library, on a regular basis. The libraries can also exchange reference materials for research purposes.

5.0 Insurance

All Exchange Students will be required to purchase adequate health (including hospitalization) insurance and accident insurance as determined by the Host Institution during the period of study and the journey back and forth between the Home and Host institutions.

6.0 Terms, Termination and Modification

This Agreement shall be valid for a period of 5 years from the date of its signature, and shall continue in force unless terminated by either party in accordance with the following clause:

Either party shall be entitled at any time and at its absolute discretion to terminate the Agreement by giving written notice six months beforehand to the other party. Such termination shall not affect exchange programs on hand at the time of the termination.

This Agreement may be modified by mutual consent in writing and signed by the two parties.

The addresses for correspondence under this Agreement are:

For Vel Tech Dr. RR & Dr. SR Technical University:

Prof. Dr. R. Rangarajan, Founder Chancellor & President,
No 42 & 60, Avadi - Vel Tech Road, Avadi, Chennai, 600 062, India.
veltech@vsnl.com

For Department of Mechanical Engineering, National Cheng Kung University

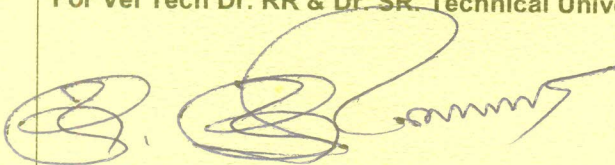
Prof. Yu-Lung Lo, Chairman, Dept of Mechanical Engg
No.1, Ta-Hsueh Road, Tainan 701, Taiwan.
<http://www.me.ncku.edu.tw>; loyl@mail.ncku.edu.tw

7.0 Jurisdiction

This agreement shall be governed by the laws of the country where the cause of action arises and the laws of such country will be applicable and the agreement is subject to the jurisdiction of the courts of the respective countries.

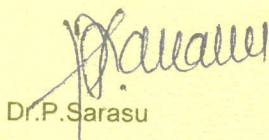
In witness where of, the parties here to caused this instrument to be executed on this day 1nd of March 2015.

For Vel Tech Dr. RR & Dr. SR. Technical University



Prof. Dr. R. Rangarajan

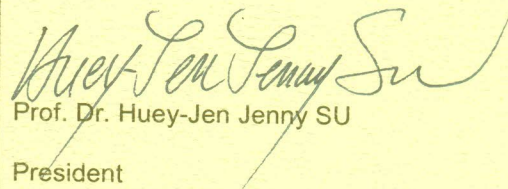
Founder Chancellor & President



Dr. P. Sarasu

Director Research & Development

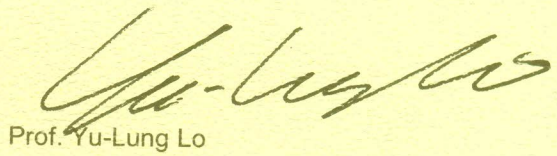
For National Cheng Kung University



Prof. Dr. Huey-Jen Jenny SU

President

For Dept. of Mechanical Engineering, NCKU



Prof. Yu-Lung Lo

Department Chair, Dept of Mechanical Engineering



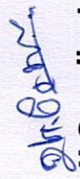
Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

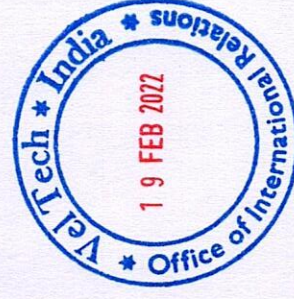
National Cheng Kung University, Dept of Mechanical Engineering, Taiwan

Name of the Research Institute/University/ Organization	Country	Duration of the Agreement	Academic Year	Date of Signing	Date of Expiry	
National Cheng Kung University, Dept of Mechanical Engineering	Taiwan	5 Years	2014-15	01.03.2015	Continue in force unless terminated by either party	Student, Cooperati Materials

Actual Activities with National Cheng Kung University, Dept of Mechanical Engineering, Taiwan

A.Y. 2017-18	Faculty Mobility (Incoming - Short Courses) - 1
A.Y. 2018-19	Student Mobility (Outgoing - Project work) - 3
A.Y. 2019-20	Student Mobility (Outgoing - Project work) - 4


MoU Coordinator





Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

School of Electrical and Communication
Department of Electrical and Electronics Engineering

Specialized one credit course on
“Basics of MEMS”
(1157EE904)

by
Prof. Dr. Chen –Kuei Chung
National Cheng kung University, Taiwan



Held on
Date: April 2 to 6, 2017

Professor, Associate Head of Department

Name	<u>Chen-Kuei Chung</u>
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E-Mail	<u>ckchung@mail.ncku.edu.tw</u>
Laboratory	
Education	1. PhD, Materials Science and Engineering, National Tsing Hua University, Taiwan
Experience	1. Professor, Mechanical Engineering, National Cheng Kung University (980801 -) 2. Associate Professor, Mechanical Engineering, National Cheng Kung University (940801 - 980731) 3. Assistant Professor, Mechanical Engineering, National Cheng Kung University (910801 - 940731) 4. Manager, Industrial Technology Research Institute (831017 - 910731)
Expertise	1. Technology of Microelectromechanical system 2. Technology and integration of Micro-fabrication 3. Fabrication and characterization of micro-nano materials 4. Semiconductor engineering 5. Inkjet technology 6. Vacuum technology 7. Materials analysis



Service

Honors

Patents

Publications

A. Journal paper

1. C.K. Chung*;M.W. Liao;H.C. Chang;C.T. Lee, "Effects of temperature and voltage mode on nanoporous anodic aluminum oxide films by one-step anodization", Thin Solid Films;, (SCI & EI 2011)
2. C.K. Chung*;T.S. Chen;N.W. Chang;M. W. Liao;C.T. Lee, "Effect of annealing temperature on the microstructure and photoluminescence of low resistivity Si/Si-N/Ta-N thin films using magnetron sputtering", Thin Solid Films;, (SCI & EI 2011)
3. C.K. Chung*;S.L. Lin;S.Y. Cheng;K.P. Chuang;H.Y. Wang, "The effect of sol-gel composition ratio and laser power on phase transformation of crystalline titanium dioxide under CO2 laser annealing", Micro & Nano Letters;, (SCI & EI 2011)
4. C.C. Peng*;C K Chung;J.F. Lin, "Effects of Al film thickness and annealing temperature on the aluminum-

- induced crystallization of amorphous silicon and carrier mobility", *Acta Materialia*, (SCI & EI 2011)
5. C.K. Chung*;T.Y. Chen;C.W. Lai, "Low-temperature formation of nanocrystalline SiC particles and composite from three-layer Si/C/Si film for the novel enhanced white photoluminescence", *J Nanopart. Res.*, (SCI & EI 2011)
 6. C.K. Chung*;T.Y. Chen;C.W. Lai, "Microstructure-induced novel white photoluminescence from rapid-thermal-annealed two-layer Si/C on Si(100) with nanocomposite Si, SiC and C nanocrystals", *Scripta Mater.*, (SCI & EI 2011)
 7. H.Y. Wang*;S.L. Lin;C.K. Chung;S. F. Chuang, "Experiment and simulation of resistance of nanoporous dentin biomaterial to CO₂ laser irradiation", *IET Nanobiotechnology*, (SCI & EI 2011)
 8. C.K. Chung*;W.T. Chang;M.W. Liao;H.C. Chang;C.T. Lee, "Fabrication of enhanced anodic alumina oxide performance at room temperatures using hybrid pulse anodization with effective cooling", *Electrochimica Acta*, (SCI & EI 2011)
 9. C K Chung*;W.T. Chang;C.F. Chen;M.W. Liao, "Effect of temperature on the evolution of diffusivity, microstructure and hardness of nanocrystalline nickel films electrodeposited at low temperatures", *Materials Letters*, (SCI & EI 2011)
 10. C.C. Peng*;C.K. Chung;B.H. Wu;M.H. Weng;C.C. Huang;J.F. Lin, "Effects of annealing conditions and thickness ratio of Si/Al films on the Hall carrier mobility, Al carrier concentration, and nanovoids formed in the metal-induced Si crystallization of Si/Al/Si/SiO₂/glass specimens", *Surface & Coatings Technology*, (SCI & EI 2011)
 11. C.K. Chung*;S.L. Lin, "On the fabrication of minimizing bulges and reducing the feature dimensions of microchannels using novel CO₂ laser micromachining", *J. Micromech. Microeng.*, (SCI & EI 2011)
 12. C.K. Chung*;T.S. Chen;N.W. Chang, "Effect of reactive gases flow ratios on the microstructure and electrical resistivity of Ta-N-O thin films by reactive co-sputtering", *Thin Solid Films*, (SCI & EI 2011)
 13. C.K. Chung*;W.T. Chang;M.W. Liao;H.C. Chang, "Effect of pulse voltage and aluminum purity on the characteristics of anodic aluminum oxide using hybrid pulse anodization at room temperature", *Thin Solid Films*, (SCI & EI 2011)
 14. C.K. Chung*;T.R. Shih;C.K. Chang;C.W. Lai;B. H. Wu, "Design and experiments of a short-mixing-length baffled microreactor and its application to microfluidic synthesis of nanoparticles", *Chemical Engineering J.*, (SCI & EI 2011)
 15. C K Chung*;W.T. Chang;M.W. Liao, "On work function and characteristics of anomalous electrodeposited nickel-cobalt films", *Thin Solid Films*, (SCI & EI 2011)
 16. C.K. Chung;T.Y. Chen;C.W. Lai, "J Nanopart. Res.", Low-temperature formation of nanocrystalline SiC particles and composite from three-layer Si/C/Si film for the novel enhanced white photoluminescence, (SCI 2010)
 17. C.K. Chung;T.Y. Chen;C.W. Lai, "Scripta Mater.", Microstructure-induced novel white photoluminescence from rapid-thermal-annealed two-layer Si/C on Si(100) with nanocomposite Si, SiC and C nanocrystals, (SCI 2010)
 18. C.C. Peng;C K Chung;J.F. Lin, "Acta Materialia", Effects of Al film thickness and annealing temperature on the aluminum-induced crystallization of amorphous silicon and carrier mobility, (SCI 2010)
 19. C.K. Chung;W.T. Chang;M.W. Liao;H.C. Chang;C.T. Lee, "Electrochimica Acta", Fabrication of enhanced anodic alumina oxide performance at room temperatures using hybrid pulse anodization with effective cooling, (SCI 2010)

20. C. K. Chung;T. S. Chen, "Microelectronics Engineering", Effect of Si/Ta and Nitrogen Ratios on the thermal stability of Ta-Si-N Thin Films;, (SCI 2010)
21. C.K. Chung;S.L. Lin, "J. Micromech. Microeng.", On the fabrication of minimizing bulges and reducing the feature dimensions of microchannels using novel CO2 laser micromachining;, (SCI 2010)
22. C.K. Chung;T.S. Chen;N.W. Chang, "Thin Solid Films", Effect of reactive gases flow ratios on the microstructure and electrical resistivity of Ta-N-O thin films by reactive co-sputtering;, (SCI 2010)
23. C.K. Chung;W.T. Chang;M.W. Liao;H.C. Chang, "Thin Solid Films", Effect of pulse voltage and aluminum purity on the characteristics of anodic aluminum oxide using hybrid pulse anodization at room temperature;, (SCI 2010)
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26. C K Chung;W.T. Chang;C.F. Chen;M.W. Liao, "Materials Letters", Effect of temperature on the evolution of diffusivity, microstructure and hardness of nanocrystalline nickel films electrodeposited at low temperatures;, (SCI 2010)
27. C. K. Chung;S. L. Lin, "Int. J. Mach. Tools Manuf.", CO2 laser micromachined crackless through holes of Pyrex 7740 glass;, (SCI 2010)
28. C.K. Chung;T.S. Chen;N.W. Chang;S.C. Chang;M.W. Liao, "Surf. Coat. Technol.", Oxidation resistance and mechanical property of cosputtered quasi-amorphous Ta-Si-N films under vacuum rapid thermal annealing;, (SCI 2010)
29. C.C. Peng;C K Chung;J.F. Lin, "J. of the Electrochemical Society", Effects of a native oxide layer on the carrier mobility and void formation at aluminum-induced crystallization of amorphous silicon;, (SCI 2010)
30. C.C. Peng;C K Chung;J.F. Lin, "Thin Solid Films", Formation of microcrystalline silicon films using rapid crystal aluminum induced crystallization under low-temperature rapid thermal annealing;, (SCI 2010)
31. C.K. Chung;A. Nautiyal;T.S. Chen, "J. Phys. D: Appl. Phys.", Low-temperature resistivity and microstructure of reactive magnetron co-sputtered Ta-Si-N thin films;, (SCI 2010)
32. C.K. Chung;K.L. Sher;Y.J. Syu;C.C. Cheng, "Microsystem Technologies", Fabrication of Cone-like Microstructure Using UV LIGA-like for Light Guide Plate Application;, (SCI 2010)
33. C.K. Chung;T.Y. Liu;W.T. Chang, "Microsystem Technologies", Effect of oxalic acid concentration on the formation of anodic aluminum oxide using pulse anodization at room temperature;, (SCI 2010)
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35. C.K. Chung;W.T. Chang;S.T. Hung, "Microsystem Technologies", Electroplating of Nickel Film at Ultra Low Electrolyte Temperature;, (SCI 2010)
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47. C.K. Chung*, "Crackless linear through-wafer etching of Pyrex glass using liquid-assisted CO₂ laser processing", Appl. Phys. A;, (SCI 2009)
48. C.K. Chung*, "A New Visible Photoluminescence in the Conducting Ta-Si-N Nanocomposite Thin Films", J. of Luminescence;, (SCI 2009)
49. C.K. Chung*, "Effect of Nitrogen Flow Ratios on the Microstructure and Properties of Ta-Al-N Thin Films by Reactive Co-sputtering", J. of the Electrochemical Society;, (SCI 2009)
50. C.K. Chung*, "Fabrication and flow test of long-term hydrophilic fluidic chip without using any surface modification treatment", Microfluidics & Nanofluidics;, (SCI 2009)
51. C.K. Chung*, "Hybrid pulse anodization for the fabrication of porous anodic alumina films from commercial purity (99%) aluminum at room temperature", Nanotechnology;, (SCI 2009)
52. C.K. Chung*, "Thickness Effect on the Formation of SiC Nanoparticles in Sandwiched Si/C/Si and C/Si Multilayers", Thin Solid Films;, (SCI 2009)
53. C.K. Chung*, "Effect of pulse frequency and current density on anomalous composition and nanomechanical properties of co-electrodeposited Ni-Co films", Thin Solid Films;, (SCI 2009)
54. C.K. Chung*, "Deep nickel metal deposition on multiscale feature sizes of a small hole and large sector cavities using electroforming", J. Micro/Nanolithography MEMS and MOEMS;, (SCI 2009)
55. C.K. Chung*, "Effect of Amorphous Si Layer on the Reaction of Carbon and Silicon in the C/Si Multilayer during Vacuum Annealing", Thin Solid Films;, (SCI 2009)
56. C.K. Chung*, "Effect of Underlying Silicon Film on the Evolution of Microstructure and Hardness of the High-temperature Annealed Carbon Film on Si Substrate", Materials Letters;, (SCI 2009)
57. C.K. Chung*, "Effect of oxalic acid concentration on the formation of anodic aluminum oxide using pulse anodization at room temperature", Microsystem Technologies;, (SCI 2009)
58. B.H. Wu*;C.K. Chung, "Effect of residual stress on nanoindented property of Si/C/Si multilayers", J. Micro/Nanolithography MEMS and MOEMS;, (SCI 2009)

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60. C.K. Chung*, "Effect of the Target Shuttering on the Characteristics of the Ta-Si-N Thin Films by Reactive Magnetron Co-sputtering", Surface & Coatings Technology;, (SCI 2009)
61. C.K. Chung*, "Effect of the Co content on the work function of the electroplated Ni-Co films", Microsystem Technologies;, (SCI 2008)
62. C.K. Chung*, "The anomalous behavior and properties of Ni-Co films codeposited in the sulfamate-chloride solution", Microsystem Technologies;, (SCI 2008)
63. C.K. Chung*, "Biomedical Microdevices", Mixing behavior of the rhombic micromixers over a wide Reynolds number range using Taguchi method and 3D numerical simulations;, (SCI 2008)
64. C.K. Chung*, "Grain boundary scattering for temperature coefficient of resistance (TCR) behavior of Ta-Si-N thin films", J. Phys. D;, (SCI 2008)
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66. C.F. Han;B.H. Wu;J.F. Lin*;C.K. Chung, "Theoretical modeling developed to evaluate the hardness and reduced modulus for the C/a-Si composite film using nanoindentation tests", Nanotechnology;, (SCI 2008)
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70. C.K. Chung*, "Formation of SiC Nanoparticles of Two-layer C/Si Films on the Si Substrate Using Thermal Annealing", Thin Solid Films;, (SCI 2008)
71. C.K. Chung*, "Effect of nitrogen flow ratio on the microstructure evolution and nanoindented mechanical property of the Ta-Si-N Thin Films", J. Mater. Res.;;, (SCI 2008)
72. C.K. Chung*, "Surface modification of SU8 photoresist for the shrinkage improvement in the monolithic MEMS microstructure", J. Micromech. Microeng;;, (SCI 2007)
73. 鍾震桂*;吳博雄;林仁輝, "超高真空離子束沈積碳矽多層奈米複合薄膜藉由熱退火機製成長碳化矽奈米顆粒之研究", ;中工高雄會刊, (中華民國期刊論文2007)
74. C.K. Chung*, "Fabrication and analysis the reflowed microlens arrays using JSR THB-130N photoresist", Microsystem Technologies;, (SCI 2007)
75. C.K. Chung*, "Effect of seed layer stress on the fabrication of monolithic MEMS microstructure", Microsystem Technologies;, (SCI 2007)
76. 吳博雄*;黃朝鈺;謝吉祥;林仁輝;鍾震桂, "超高真空離子束濺鍍系統", ;中工高雄會刊, (中華民國期刊論文2007)
77. C.K. Chung*, "Thickness Effect on the Formation of SiC Nanoparticles in Sandwiched Si/C/Si and C/Si Multilayers", Thin Solid Films;, (SCI 2007)
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81. C.K. Chung*, "A hybrid CO₂ laser processing for silicon etching", Optics Express;;, (SCI 2007)
82. C.P. Liu;D.H. Chen;J.J. Wu;J.C. Huang;C.K. Chung, "A Multidisciplinary Introductory Nanotechnology Course with Hands-on Experiments", Journal of Materials Education;;, (other 2007)
83. J-J Junz Wang*;C.K. Chung, "Fabrication of Wedge-Shape Tool via Electrochemical Micromachining with Diamond-like Carbon Coating", Journal of Materials Processing Technology;;, (SCI 2007)
84. C.K. Chung*, "Effect of pulse frequency on the morphology and nanoindentation property of electroformed Ni films", Microsystem Technologies;;, (SCI 2007)
85. C.K. Chung*, "Fabrication of the monolithic polymer-metal microstructure by the backside exposure and electroforming technology", Microsystem Technologies;;, (SCI 2007)
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129. 鍾震桂*, "共濺鍍法成長Ta-Al電阻材料的成份與特性研究", 中國材料科學學會2003年年會;, (2003)

20h MEMS Outline

Basic MEMS and Applied Cases

Class: Undergraduate to graduate

Time: 20h of 6 lectures for 5 days

Place: Mechanical department, Veltech, India

Lecturer: Dr. Chen-Kuei Chung, email: ckchung@mail.ncku.edu.tw

Pre-course: None

Goal: To learn basic MEMS/NEMS process, material, integration and application so as to benefit for the future study & research.

Outline and schedule

Day	Lectures	Content	Notes
1	L1 (2h), L2 (2h)	L1: Introduction of MEMS/NEMS * Background: Transducers= sensors+actuators+structure+IC * Scaling effect: new domain/ phenomenon * Trend: a. Fabrication: 3D structure, high aspect ratio, movable design, nanofabrication(NEMS), multi-material b. Device & application L2: Basic micromachining modules * Thermal process & ion implantation * Pattern transfer: photolithography, resist (thin/thick), etching * Thin (/Thick) film: PVD, CVD, electrochemical(/ electroless) deposition, casting (PDMS)	
2	L3 (4h)	L3: Si bulk micromachining (subtractive) * Si crystallography & as a mechanical element * Wet etching: isotropic & anisotropic etching * Dry etching: plasma/reactive ion/vapor phase etching * Deep RIE/ICP etching	
3	L4 (4h)	L4: Si surface micromachining (additive) * Mechanical properties of thin films * Process & material: IC compatibility * Sacrificial, anti-stiction and modification process * MUMPs: Multi-User MEMS Process	
4	L5 (4h)	L5: Non-Si micromachining * LIGA: X-ray lithography, electroforming and micromolding * LIGA-like process: UV-, ICP-, laser- LIGA-like * Thick resist UV lithography * Laser micromachining * EDM (electrical discharge machining)	Incl. 1h test (L1~L5)
5	L6 (4h)	L6: Case study & discussion * Inertial (mechanical force) transducers * Microfluidic transducers * Thermal/ optical transducers * Advanced MEMS/NEMS (material, structure, process)	Adjustable, dependent on class discussion

Major references:

1. Marc Madou, "Fundamentals of Microfabrication", 2nd ed., CRC press, 2002
2. Gregory T.A. Kovacs, "Micromachined Transducers Sourcebook", WCB/McGraw-Hill, 1998.
3. MEMS related website/lectures/books

IR 194

(Estd. u/s 3 of UGC Act, 1956)

Visiting Professor Programmes

014

**Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology,
Chennai, India**

Department of Electrical and Electronics Engineering

Course Title: Basics of MEMS

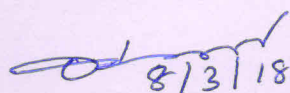
Professor: Dr. Chen-Kuei Chung

University: National Cheng Kung University, Taiwan

Duration: 20Hrs

Schedule:

Date	9.45am to 12.45pm	12.45pm to 01.45pm	1.45pm to 2.45pm	3pm to 4pm
02.04.2018	Class on Basics of MEMS	Lunch	Class on Basics of MEMS	Introductory meetings with Higher officials
03.04.2018				Visit to Research facilities
04.04.2018				Discussions with HoD
05.04.2018				Interactive session with faculty members regarding research
06.04.2018				Final meeting at Directorate of International Relations


8/3/18

HoD/ EEE

Dr. P. Chandrasekar
Head of the Department
Electrical and Electronics Engineering

Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

SNo	Stu_Id	Stu_Name	Stu_Branch	Stu_Test_SubjectCode	Stu_Test_SubjectName	Stu_Subject_Pas	Stu_Grade
1	VTU8546	GANDIKOTA CHAKRADHAR	EEE	1157EE904	Basics of MEMS	Pass	C
2	VtU7495	MAGESH S	EEE	1157EE904	Basics of MEMS	Pass	C
3	VTU8500	SANDEEP SARAN	EEE	1157EE904	Basics of MEMS	Pass	C
4	VTU8551	BANDI TRINATH	EEE	1157EE904	Basics of MEMS	Pass	C
5	VTU8553	BODAKUNTA SAI KUMAR	EEE	1157EE904	Basics of MEMS	Pass	C
6	VTU8504	SALMAN S	EEE	1157EE904	Basics of MEMS	Pass	C
7	VTU8530	SIVA KUMAR S	EEE	1157EE904	Basics of MEMS	Pass	C
8	VtU8024	INDULEKHA K	EEE	1157EE904	Basics of MEMS	Pass	B
9	VTU8562	CHEPURI NARASIMHA RAO	EEE	1157EE904	Basics of MEMS	Pass	B
10	VTU8507	NIKITA SHANKER	EEE	1157EE904	Basics of MEMS	Pass	B
11	VtU7826	DUMPALA DEVA MAHESH	EEE	1157EE904	Basics of MEMS	Pass	B
12	VTU8543	SHRIKANT KUMAR SINGH	EEE	1157EE904	Basics of MEMS	Pass	A
13	VtU7500	VEGILSETTY VENKATA SUNIL KUMAR	EEE	1157EE904	Basics of MEMS	Pass	A
14	VtU7502	RAMPALI YASWANTH	EEE	1157EE904	Basics of MEMS	Pass	B
15	VtU8402	AVINASH KUMAR	EEE	1157EE904	Basics of MEMS	Pass	A
16	VtU7488	PENUBADI SRIDHAR	EEE	1157EE904	Basics of MEMS	Pass	A
17	VtU7490	VALLEPU BHASKAR	EEE	1157EE904	Basics of MEMS	Pass	C
18	VTU6434	OKRAM KELPER SINGH	EEE	1157EC923	Fault Tolerant Computing	Pass	D
19	VTU5959	RAJESH HEMBRAM	EEE	1157EE904	Basics of MEMS	Pass	A
20	VTU8529	VINOTH KUMAR M	EEE	1157EE904	Basics of MEMS	Pass	A
21	VtU8169	TELLAKULA VEERA DESHIK CHARAN	EEE	1157EE904	Basics of MEMS	Pass	A
22	VTU8508	SUBHAM DAM	EEE	1157EE904	Basics of MEMS	Pass	A
23	VTU6366	AKASH BHOWMICK	EEE	1157EE904	Basics of MEMS	Pass	S
24	VTU6365	MISHRA AYAN ANUP	EEE	1157EE904	Basics of MEMS	Pass	S
25	VtU8337	SONU KUMAR	EEE	1157EE904	Basics of MEMS	Pass	C
26	VtU7501	SIDDHARTH S	EEE	1157EE904	Basics of MEMS	Pass	C
27	VtU7487	PENUBADI VIJAY	EEE	1157EE904	Basics of MEMS	Pass	C
28	VtU7915	SEERAPU JAGADEESH	EEE	1157EE904	Basics of MEMS	Pass	C
29	VtU7499	ACHUKATLA JAMEEL	EEE	1157EE904	Basics of MEMS	Pass	C
30	VtU7493	ALA SANTHI	EEE	1157EE904	Basics of MEMS	Pass	B
31	VtU7494	R ANURADHA	EEE	1157EE904	Basics of MEMS	Pass	B
32	VtU8278	NELATURI ABHISHEK VIJAY RAJ	EEE	1157EE904	Basics of MEMS	Pass	B

33	VtU8393	MD IRFAN ALI	EEE	1157EE904	Basics of MEMS	Pass	B
34	VtU7503	KOPPARAPU ANIRUDH	EEE	1157EE904	Basics of MEMS	Pass	B



Vel Tech
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R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

- DIWT/04-18/02

Our Ref. No: 2018/VF 82	Your Ref. No:
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Submitted for the Approval:

Name of the Professor: Prof. Dr. Chen- Kuei- Chung

University & Country : National Cheng Kung University (NCKU), Taiwan

Course Title : Basics of MEMS

Department : Electrical and Electronics Engineering

Students : 34

Program date : 02.04.2018 to 06.04.2018

Sl.No	Description	Amount in INR	Amount in TWD
1	Course Honorarium (Rs.3000 * 20 Hrs) (Net Amount & Tax Free)	60000	26871
2	Visa Processing Charges - 5374 NTD (1 TWD= 2.12530 INR as on 15.03.2018)	11421	5374
	Total	71421	32245

(Rupees Seventy one thousand four hundred and twenty one only)

In this regard, according to the request of Professor, I request your approval for transferring the amount to the following account in TWD,

Name: Chen-Kuei Chung (鍾震桂)

Acc. No: 004-081-007-45532-5

Bank: Bank of Taiwan

Branch: Yung Kang

SWIFT Code: BKTWTWTP081

Thank You

S. Sivaperumal

Register : 1/03.06.2018.

3/4



Department and Institute of Aeronautics and Astronautics
National Cheng Kung University

Date: 29th March, 2019

CERTIFICATE OF COMPLETION

To Whom It May Concern,

It is to certify that **Mr. Hari Krishnan M K**, a student from **Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology**, has completed his final semester project work under the topic **Design and Analysis of Three Phase Permanent Magnet Synchronous Motor for a Stirling Cooler on JMAG Designer** under the student exchange program from **September, 2018 to April, 2019** at **National Cheng-Kung University, Taiwan, R. O. C.**



Wei-Hsiang Lai

Wei-Hsiang, Lai
Chairman

Department of Aeronautics and Astronautics National Cheng Kung University
No.1 Ta Shieh Road
Tainan 70101, Taiwan (R.O.C.) Email: whlai@mail.ncku.edu.tw



Department and Institute of Aeronautics and Astronautics
National Cheng Kung University

Date: 29th March, 2019

CERTIFICATE OF COMPLETION

To Whom It May Concern,

It is to certify that **Mr. S. Sai Srinivas**, a student from **Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology**, has completed his final semester project work under the topic **Design and Analysis of Three Phase Permanent Magnet Synchronous Motor for a Stirling Cooler on JMAG Designer** under the student exchange program from **September, 2018 to April, 2019** at **National Cheng-Kung University, Taiwan, R. O. C.**

Wei-Hsiang Lai

Wei-Hsiang, Lai
Chairman

Department of Aeronautics and Astronautics National Cheng Kung University
No.1 Ta Shieh Road
Tainan 70101, Taiwan (R.O.C.) Email: whlai@mail.ncku.edu.tw





National Cheng Kung University
Department of Mechanical Engineering



Certificate of Completion

This is to certify that

Mr. JERRIPOTHULA VENKATA SARATH KUMAR

has completed his Student Exchange Program from **September 07, 2018 to April 01, 2019**
in the department of Mechanical Engineering at
National Cheng Kung University , Taiwan.

A handwritten signature in blue ink, reading 'Ming-Shaung Ju', written over a horizontal line.

Prof.Ming-Shaung Ju



Stamp of institution



Department of Mechanical Engineering
NATIONAL CHENG KUNG UNIVERSITY
Tainan, Taiwan 701, Republic of China
Telephone: (06)2757575 Ext.62100
Fax: 886-6-2352973

May 07, 2020

TO WHOM IT MAY CONCERN

This is to certify that **MR. RUTHALA BARGHAVA SRI VENKATESH SIVA KUMAR**, an exchange student from Vel_Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, India successfully completed a 9 months (Sept-2019 to May-2020) internship program under my esteemed guidance in Servo Control Lab, Department of Mechanical Engineering, National Cheng Kung University (NCKU). He is part of a research project titled "Electronically controlled variable transmission of an electric vehicle". During the period of the internship program, he was punctual, hardworking, inquisitive, and of good behavior.

A handwritten signature in black ink that reads "Mi-Ching Tsai".

Dr. Mi-Ching Tsai, Chair professor
Department of Mechanical Engineering
National Cheng Kung University,
1 University Road, 701 Tainan, Taiwan
Email: metsai@mail.ncku.edu.tw



國立成功大學

National Cheng Kung University

CERTIFICATE

This certificate that

Mr. BANDARLA VINAY KUMAR

has successfully completed the research internship with the title of “**AN EXPERIMENTAL METHOD OF DETERMINING THE HARDNESS AND YOUNG’S MODULE BY USING NANO-INDENTATION**” in Tribology laboratory from September 5th 2019 to March 25th 2020, National Cheng Kung University, Taiwan.

Jenfin Lin 

Dr. JEN FIN-LIN

Chair Professor



國立成功大學
National Cheng Kung University

CERTIFICATE

This is to certify that **Mr. Dumpala. Chakravarthy**, an exchange student from Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, India has been successfully completed a 9months (Sept-2019 to June-2020) internship program under my esteemed guidance in Nano/Micro-Structure and Applied Physics Lab, Department of Mechanical Engineering, National Cheng Kung University (NCKU). He is part of research project titled "An Ultrasonic Solid Plate Sensor based on Piezoelectric Transducers and Machine Deep Learning." During the period of the internship program, he was punctual, hardworking, inquisitive and of good behavior.

Dr. Yung-Chun Lee, Distinguished Professor
Department of Mechanical Engineering
National Cheng Kung University,
1 University Road, Tainan, Taiwan 70101,
Email: yunglee@mail.ncku.edu.tw



國立成功大學
National Cheng Kung University

CERTIFICATE

This certifies that

Mr. MULLAPAKU SAI VENKATA RAJU

has successfully completed the research internship with the title
**“AN EXPERIMENTAL METHOD OF DETERMINING THE
HARDNESS AND YOUNG’S MODULE BY USING NANO-
INDENTATION”** in Tribology laboratory at Department of
Mechanical Engineering from September 5th 2019 to March 25th
2020, National Cheng Kung University, Taiwan.

Dr. JEN FIN-LIN
Chair Professor