

**MEMORANDUM OF UNDERSTANDING FOR INTERNATIONAL  
RESEARCH COLLABORATION**

between

Indian Institute of Technology, Roorkee  
Roorkee, India

and

The University of Western Ontario  
London, Ontario, Canada

THIS AGREEMENT is effective as of the 16<sup>th</sup> day of March, 2005 and is entered into between the Indian Institute of Technology Roorkee (IITR), India , and The University of Western Ontario (UWO), c/o Research Development Services—International Research, Stevenson-Lawson Building, London, Ontario N6A 5B8, Canada.

IN CONSIDERATION OF the mutual covenants of the parties set forth below, the parties agree as follows:

1. **PURPOSE**

The IITR and The University of Western Ontario believe that the quality of research and teaching is strengthened by the establishment of international cooperation links and wish to enter into research collaboration and exchange activities with a view to their mutual enrichment in scientific, academic, and cultural areas.

2. **OBJECTIVE**

The general objective of this agreement is to establish long-term research collaboration exchange programs in fields which are compatible with the orientation of each institution , and which are relevant to the industrial, scientific, social and cultural interests and needs of the countries in which the parties are respectively located.

The initial focus will be in the areas of civil, chemical, electrical and mechanical engineering. Other areas of cooperation may develop at a later time.

3. **MANNER OF IMPLEMENTATION**

The collaboration contemplated by the Agreement will be implemented by any one or more of the following:

- a. the exchange of researchers,
- b. the exchange of scholarly and materials,
- c. the coordination of collaborative research programs.

For purposes of this Agreement, "researchers" means the following:

- ♦ faculty members
- ♦ postdoctoral fellows
- ♦ graduate students participating in the exchange for the purpose of research

4. **EXCHANGE OF RESEARCHERS**

- a. The participation of any researcher from either institution in the exchange will be subject to the prior approval of such researcher by the other institution.
- b. Each institution undertakes to maintain the salary and supplementary benefits of its own faculty members who participate in the exchange, consistent with its faculty leave policies and other policies in effect from time to time.
- c. Each institution will endeavour to raise funds for travel to the host institution for its own researchers wishing to participate in the exchange. On a case by case basis, each institution will endeavour to provide visiting researchers with financial assistance as possible and/or appropriate.
- d. Participants from each of the institutions, while in attendance at the other institution's facilities, shall abide by the rules and regulations of that host institution regarding the use of facilities and conduct, and shall be subject to the laws of the host country.

5. **RESEARCH PROGRAM MANAGEMENT**

Each institution will appoint one (or, if appropriate, more than one) research program coordinator to ensure that the research collaboration proceeds according to a reasonable plan and to ensure that the purposes, objectives and terms of this Agreement are carried out. Each institution may at any time name a successor to, or replacement of, its research program coordinator(s).

For the initial period of the agreement the research directors will be:  
Prof. Ravi Bhushan, Professor-In-Charge Finance, and Head Chemistry Department, IIT Roorkee  
Prof. Rajiv K. Varma, Faculty of Engineering, University of Western Ontario

7. **DURATION OF VISITS OF EXCHANGE RESEARCHERS**

Visits may range for a period of 2 weeks to 2 years, subject to mutual agreement between the two institutions.

8. **INTELLECTUAL PROPERTY**

In the context of their respective policies and procedures, both universities agree to share any intellectual property that is developed as a result of collaboration between the institutions pursuant to this agreement. Intellectual property that has been independently developed by a institution shall be retained by the originating

institution. This provision is the over-arching agreement in principle, and shall be administered in accordance with the attached *Intellectual Property Statement*.

9. **INSURANCE**

The parties to this Agreement acknowledge that they do not provide visiting researchers with medical or hospital or personal property insurance.. It is required that visiting researchers, or their home institution, ensure that adequate provision for their needs is made in these areas.

At The University of Western Ontario, visiting researchers are required to purchase coverage under the University Health Insurance Program (UHIP) from the Department of Pensions and Benefits, unless they can demonstrate that they already possess equivalent or greater coverage from another insurance program or plan.

IITR will provide visiting researchers and graduate students from UWO with access to the medical facilities as available in its Health Centre.

11. **DURATION AND AMENDMENT OF AGREEMENT**

This general Agreement shall have effect and be binding upon the parties hereto for a period of five (5) years from the date of approval / ratification by the appropriate authority of each signatory institution. Each institution represents that it has the authority to enter into this Agreement and to support the intended collaborative research initiatives. This Agreement may only be amended by the mutual consent of all parties in writing.

12. **EARLY TERMINATION**

This Agreement may be terminated at any time upon the written mutual consent of the parties, or upon either party giving twelve months written notice of termination.

13. **FREEDOM FROM DISCRIMINATION**

Each party acknowledges to the other that it subscribes to a policy of non-discrimination, which requires its employees not to discriminate on the basis of race, sex, sexual orientation, age, ethnicity, religion, or national origin. Each institution shall abide by these principles in the administration of this Agreement and neither institution shall impose criteria for the exchange of researchers that would violate these principles of non-discrimination.


14. **LANGUAGE**

Although a translation of this Agreement may be prepared in another language, it is understood and agreed that this English-language version is the official and binding document between the parties.

IN WITNESS WHEREOF the parties have executed this Agreement with effect as of the date first written.

**THE UNIVERSITY OF WESTERN ONTARIO**

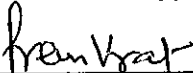
The Board of Governors

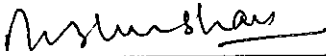
Per:   
Gregory A. Moran, Vice-President (Academic) and  
Provost

Per:   
W.E. (Ted) Hewitt, Acting Vice-President (Research)

Per:   
Janis K. Van Fleet, Secretary of the Board

**Indian Institute of Technology, Roorkee**

Per:   
Prof. Prem Vrat, Director

Per:  19 Jan 05  
Prof. Ravi Bhushan, Professor-In-Charge Finance, and  
Head, Chemistry Department

## AGREEMENT FOR INTERNATIONAL RESEARCH COLLABORATION

### *Intellectual Property Statement (Clause 7)*

a) For purposes of this section:

i) "Intellectual Property" means, without limitation, any and all know-how, processes, technologies, software, specifications, drawings, flow charts, sketches, models, samples, technical or business information or data, inventions, discoveries, techniques, technical information and all related intellectual property rights worldwide arising under any law, and whether or not statutorily protected, including all i) patents, patent applications and patent rights; ii) copyright registrations, copyright applications and copyright rights; iii) industrial designs and industrial design applications; iv) trademarks, trademark applications, trademark registrations, and trademark rights; v) rights relating to the protection of confidential information; vi) any other proprietary rights relating to intangible property; and vii) divisions, continuations, renewals, reissues and extensions of any of the above (as and to the extent applicable) now existing or hereafter filed, issued or acquired;

ii) "Project" means any form of collaboration including, but not limited to, a training, research or service delivery program, project or subject area in which the parties collaborate or assist each other as contemplated by this Agreement; and

iii) Where a provision is to the effect that The University of Western Ontario owns any Intellectual Property, such provision shall be read to mean that The University of Western Ontario, or its faculty members, other employees or students that are participants in the Project, own such Intellectual Property in accordance with its policies and any applicable collective agreement.

(b) Unless the parties have otherwise agreed in writing with respect to a specific research program or Project prior to commencement of work on such Project:

(i) All Intellectual Property of an institution (and its third party licensors) that existed on the date of commencement of the Project or that is subsequently created or acquired solely by any such institution in performing the work under the Project shall be owned by that institution. The other universities shall have a personal, non-exclusive right to use such Intellectual Property provided by the first named institution for purposes of the Project and for internal teaching and research purposes.

(ii) Ownership of jointly developed Intellectual Property shall be determined by the participating universities on a Project basis, having regard to the nature, quality and extent of the contributions by the respective universities.

(iii) Any commercialization of jointly-developed Intellectual Property, including publication or other disclosure, shall be as determined in advance by all the respective program directors of the contributing universities.

(iv) Any dispute in connection with the ownership, commercialization, publication, or other rights in connection with jointly-developed Intellectual Property shall be determined by arbitration in accordance with the rules of the International Chamber of Commerce.

### IITR DEPARTMENTAL ELECTIVES

S.NO	SUBJECT CODE	COURSE TITLE
1	EE-544	Microprocessor Controlled Electric Drives.
2	EE-545	Embedded Controller and its Applications.
3	EE-546	Design of Electric Drives
4	EE-547	Instrumentation in Electric Drives
5	EE-548	Drive System in Electric Traction
6	EE-549	Control Techniques in Power Electronics for AC Drives
7	EE-550	Pulse Width Modulation for Power Converters
8	EE-551	Topologies of Enhanced Power Quality AC/DC Converters
9	EE-552	SWITCH Mode Power Supply
10	EE-553	Power Quality Improvement Techniques
11	EE-555	CAD of Power Apparatus
12	EE-556	Selected Topics in Machines and Transformers
13	EE-557	Synchronous Machines and System Stability
14	EE-558	Special Machines

**COURSE STRUCTURE FOR IDD 4<sup>th</sup> YEAR  
B.Tech (Elect. Engg.) and M.Tech. (Power Electronics)**

S.NO	SUBJECT CODE	COURSE TITLE
<b>Semester-VII (Autumn)</b>		
1.	EE-401	Power System Protection
2.	EE-540	Advanced Power Electronics
3.	EE-541	Electric Drives-I
4.		Departmental Elective-I
5.	EE-405	Field Training
6.		Institute Elective-V (Social Science)
<b>Semester-VIII (Spring)</b>		
1.	EE-554	FACTS Devices
2.	EE-543	Electric Drives-II
3.	EE-503	Modeling, Simulation & Evolutionary Techniques
4.		Departmental Elective-II
5.		Departmental Elective-III
6.		Research Project (to be evaluated in the beginning of next semester)

**Course Structure for IDD 1<sup>st</sup> Year**  
**B.Tech. (Elect. Engg.) and M.Tech. (Power Electronics)**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weightage (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- I (Autumn)</b>														
1.	MA-101	Mathematics-I	BSC	4	3	1	0	3	-	25	-	25	50	-
2.	PH-101	Physics-I	BSC	5	3	1	2	3	3	15	15	15	40	15
3.	EE-101	Electrical Science	ESC	4	3	1	2/2	3	-	15	15	30	40	-
4.	EC-101A	Computer Systems & Programming	ESC	4	3	0	2	3	-	15	15	30	40	-
	EC-101B	Fundamentals of Object Oriented Programming		4	3	0	2	3	-	15	15	30	40	-
5.	MI-102	Manufacturing Techniques	ESC	3	2	0	2	2	-	15	15	30	40	-
6.	BT-101	Fundamentals of Biotechnology	GSC	2	2	0	0	2	-	25	-	25	50	-
7.	HS-101	Technical Communication	HSSMC	2	1	0	2	2	-	25	-	25	50	-
		Total		24	17	3	9							
<b>Semester-II (Spring)</b>														
1.	MA-102	Mathematics-II	BSC	4	3	1	0	3	-	25	-	25	50	-
2.	CY-101	Chemistry	BSC	5	3	1	2	3	3	15	15	15	40	15
3.	EC-102	Basic Electronics	ESC	4	3	1	2/2	3	-	15	15	30	40	-
4.	CE-101	Engineering Graphics	ESC	4	2	0	4	3	-	-	25	25	50	-
5.	MI-101	Thermodynamics	ESC	3	2	1	0	2	-	25	-	25	50	-
6.	CE-102	Environmental Studies	GSC	2	2	0	0	2	-	25	-	25	50	-
7.	HS-102	Economics & IPR	HSSMC	3	2	1	0	2	-	25	-	25	50	-
		Total		25	17	5	7							

**Course Structure for IDD 2<sup>nd</sup> Year**  
**B.Tech. (Elect. Engg.) and M.Tech. (Power Electronics)**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weightage (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- III (Autumn)</b>														
1.	CE-	Computer Aided Graphics	ESC	2	1	0	2	2	-	15	15	30	40	-
2.	PH-	Physics-II	BSC	3	2	1	0	2	-	25	-	25	50	-
3.	MT-	Material Science	ESC	4	3	1	0	3	-	25	-	25	50	-
4.	HS-	Behavioral Science	HSSMC	2	2	0	0	2	-	25	-	25	50	-
5.	EE-201	Network Theory	DCC	4	3	1	0	3	-	25	-	25	50	-
6.	EE-203	Electrical Measurements and Measuring Instruments	DCC	4	3	0	2	3	2	15	15	15	40	15
7.		Institute Elective-I (Basic Science)	IEC	3	2	1	0	2	-	25	-	25	50	-
		Total		22	16	4	4							
<b>Semester-IV (Spring)</b>														
1.	HS-	Management Concepts and Practices	HSSMC	3	2	0	2	2	-	15	15	30	40	-
2.	AH-	Energy Resources	GSC	2	2	0	0	2	-	25	-	25	50	-
3.	EE-202	Electrical Machines –I	DCC	5	3	1	2	3	3	15	15	15	40	15
4.	EE-204	Electro Magnetic Field Theory	DCC	3	2	1	0	2	-	25	-	25	50	-
5.	EE-206	Power Electronics	DCC	4	3	1	2/2	3	2	15	15	15	40	15
6.	EE-208	Digital Electronic Circuits and Systems	DCC	4	3	1	2/2	3	3	15	15	15	40	15
7.		Institute Elective-II (Basic Science)	IEC	3	2	1	0	2	-	25	-	25	50	-
		Total		24	17	5	4							

**Course Structure for IDD 3<sup>rd</sup> Year  
B.Tech. (Elect. Engg.) and M.Tech. (Power Electronics)**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weightage (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- V (Autumn)</b>														
1.	EE-301	Power System Engineering	DCC	4	3	1	2/2	3	-	15	15	30	40	-
2.	EE-303	Electrical Machines-II	DCC	5	3	1	2	3	3	15	15	15	40	15
3.	EE-305	System Engineering	DCC	3	2	1	0	2	-	25	-	25	50	-
4.	EE-307	Microprocessors	DCC	5	3	1	2	3	3	15	15	15	40	15
5.	EE-309	Applied Instrumentation	DCC	3	2	1	2/2	2	-	15	15	30	40	-
6.		Institute Elective-III (Engineering Science)	IEC	4	3	1	0	3	-	25	-	25	50	-
		Total		24	16	6	5							
<b>Semester-VI (Spring)</b>														
1.	EE-302	Power System Analysis & Control	DCC	3	2	1	0	2	-	25	-	25	50	-
2.	EE-306	Control Systems	DCC	5	3	1	2	3	3	15	15	15	40	15
3.	EE-308	Electronic Instrumentation	DCC	3	2	1	2/2	2	-	15	15	30	40	-
4.	EE-567	HVDC Systems	MSC	4	3	1	0	3	-	25	-	25	50	-
5.	EE-310	Communication Skills	DCC	2	0	0	2	-	-	100	-	-	-	-
6.		Institute Elective-IV (Engineering Science)	IEC	4	3	1	0	3	-	25	-	25	50	-
		Total		21	12	5	6							

**Course Structure for IDD 4<sup>th</sup> Year**  
**B.Tech. (Elect. Engg.) and M.Tech. (Power Electronics)**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weightage (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- VII (Autumn)</b>														
1.	EE-401	Power System Protection	DCC	4	3	0	2	3	3	15	15	15	40	15
2.	EE-540	Advanced Power Electronics	MSC	5	3	1	2	3	-	15	15	30	40	-
3.	EE-541	Electric Drives-I	MSC	4	3	1	2/2	3	-	15	15	30	40	
4.		Departmental Elective-I	DEC	4	3	1	0	3	-	25	-	25	50	-
5.	EE-405	Field Training	DCC	2	0	0	2	-	-	100	-	-	-	-
6.		Institute Elective-V (Social Science)	IEC	3	2	1	0	2	-	25	-	25	50	-
		Total		22	14	4	5							
<b>Semester-VIII (Spring)</b>														
1.	EE-554	FACTS Devices	MSC	4	3	1	0	3	-	25	-	25	50	-
2.	EE-543	Electric Drives-II	MSC	4	3	1	0	3	-	25	-	25	50	-
3.	EE-503	Modeling, Simulation & Evolutionary Techniques	MSC	4	3	-	2	3	-	15	15	30	40	-
4.		Departmental Elective-II	DEC	4	3	1	0	3	-	25	-	25	50	-
5.		Departmental Elective-III	DEC	4	3	1	0	3	-	25	-	25	50	-
6.		Research Project (to be evaluated in the beginning of next semester)	RP	-										
		Total		20	15	4	2							

**Course Structure for IDD 5<sup>th</sup> Year  
B.Tech. (Elect. Engg.) and M.Tech. (Power Electronics)**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weightage (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- IX(Autumn)</b>														
1.		Seminar	DCC	2	-	-	-	-	-	-	-	-	-	-
2.		Project	DCC	4	-	-	-	-	-	-	-	-	-	-
3.		Research Project (contd. from VIII semester)	RP	3										
4.		Dissertation (to be continued next semester but evaluated in this semester also)	DCC	-	-	-	-	-	-	-	-	-	-	-
		Total		9										
<b>Semester-X (Spring)</b>														
1.		Dissertation (contd. From IX semester)	DCC	24	-	-	-	-	-	-	-	-	-	-
		Total		24	8	3	8							

**Comparison of IITR-UWO Dual Degree program with  
Accelerated MEd program of UWO**

<b>Period</b>	<b>IITR-UWO Dual Degree program</b>	<b>Accelerated MEd program of UWO</b>
<b>Year 1</b>	Same as first three years of IITR B.Tech program	Same as first three years of UWO BEd program
<b>Year 2</b>		
<b>Year 3</b>		
<b>Summer Term</b>	Summer internship at UWO which forms a part of dissertation	Summer internship at UWO which forms a part of dissertation
<b>Year 4 (to be completed by April)</b>	Required courses + 4 <sup>th</sup> year project of 2 credits. <u>Note:</u> The required courses include 3-5 graduate courses. One of these may be considered as graduate Elective 1 course to meet the requirement of the Masters program.	Required Undergraduate courses + 4 <sup>th</sup> year project of 8 credits + One additional graduate Elective 1 course to meet the requirement of the Masters program.
<b>Summer Term (May-Aug)</b>	Dissertation	Dissertation +Elective 2
<b>Fall Term (Sep- Dec)</b>	Elective 2, Elective 3	Elective 3, Elective 4
<b>WinterTerm (Jan-Apr)</b>	Dissertation, Elective 4	Dissertation. <i>The program ends.</i>
<b>Summer Term (May-Aug)</b>	Dissertation (This summer term is additional to this program in order to compensate the shortfall of 6 credits of project in 4 <sup>th</sup> year). <i>The program ends.</i>	

**Salient Features:**

**IITR-UWO Dual Degree program:** During first three years the student studies all course of BTech program. In the fourth year, graduate courses are introduced as part of the program. Further, the summer term after third year is spent on dissertation/thesis.

**Accelerated MEd program of UWO:** During first four years the student studies all course of BEd program. In addition, the student takes one extra graduate course. Further, the summer term after third year is spent on dissertation/thesis.

**Time Schedule**

<b>Years</b>	<b>Academic Terms</b>	<b>Activities at IITR</b>	<b>Activities at UWO</b>
Year 1 & 2	Term 1: Aug - Dec	Studies at IITR	
	Term 2: Jan - May	Studies at IITR	
	Summer: May - July	Studies at IITR	
Year 3	Term 1: Aug - Dec	Studies at IITR	
	Term 2: Jan - May	Studies at IITR	Applications to UWO for Dual Degree finalized; co-supervisor identified at IITR for selected students
	Summer: May - July		Research Internship as Visiting Student at UWO under UWO faculty
Year 4	Term 1: Aug - Dec	Studies at IITR (including project and graduate course requirements of UWO)	
	Term 2: Jan - May	Studies at IITR (including project and graduate course requirements of UWO); B.Tech degree requirement of IITR completed	
	Summer: May - July		Student joins as UWO full-time M.E.Sc. student; <ul style="list-style-type: none"> <li>• Starts paying fee as international student</li> <li>• Starts receiving all eligible scholarships as a UWO student</li> </ul>
Year 5	Sep - Dec		Full-time UWO student
	Jan - Apr		Full-time UWO student
	May - Aug	B.Tech degree awarded from IITR, effective previous year	Full-time UWO student Completes M.E.Sc. degree requirements. M.E.Sc. degree awarded by UWO