Grades K - 8-hour short courses

ROBOTICS & NANO/BIO TECHNOLOGY

Innovative Micro and Nano Technology Short Courses for K – 12 offered jointly by Michigan State U, NSF WIMS ERC and Nanobrick

UNIQUE LEARNING:

“We mix dry learning topics with plastic pieces (Megablocks, Legos, etc.) drive them around with robots, levitate them in the air with static charges from LEGO Van de Graaff generators.” Suddenly the ‘difficult to learn’ topics become fun and everyone wants to learn them.

In an innovative K – Ph.D. education and research program, developed at MSU, graduate and undergraduate students mentor K-12 students in hands-on Technology Assisted Science, Engineering and Mathematics (TASEM) activities. The TASEM environment uses micro and nano technologies to teach science, technology, engineering and mathematics to children of all grades/levels in a very interesting and exciting manner.

The science teachers can also be trained using onsite or live video sessions for independent running of these short courses in schools and colleges world-wide. For live video sessions for TASEM introduction and teacher training using onsite and live video conferencing contact Prof. Aslam.

DURATION AND COST: For courses run in Michigan, USA

In 8-hour short-courses (spread over 4 days) designed for all levels of K-12, the children (typically 3-5 per group) learn basics, do one TASEM experiment, work on a project and present it to their parents and teachers. Each 8-hour SC costs $248.00 per student ($ 148 for courses on MSU campus subsidized by NSF ERC for WIMS). Returning children will continue at a higher level. A child registered for multiple SCs will be moved to higher level after each course. All activities, with the exception of HD video, will involve programmable robots. For international courses a different duration and cost can be negotiated.

WHAT IS NEW IN 2010?

☺ Kindle Electronic Library: Books on robots and other topics on Kindle (Amazon).
☺ Biomedical Modules: LEGO-based DNA and gene control modules.
☺ RFID Modules: NXT robots used to explain radio frequency identification (RFID).
☺ Trigonometry and Nano-math: Simple LEGO creations explain math concepts.

Areas Offered:

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<th>Learning Area</th>
<th>Learning Goals/Objectives</th>
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<tr>
<td>1 Programmable Robots, NXT/RCX/MSU</td>
<td>Sensors, motors, gear trains, robot-building, -control &amp; -programming, math &amp; engineering concepts</td>
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<tr>
<td>2 NXT with RFID Sensor</td>
<td>RFID reader on NXT, robots wit RFID tags, supply chain concept</td>
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<tr>
<td>3 Biomedical, DNA, genes</td>
<td>Sensors, motors, gear trains, robot-building, -control &amp; -programming, science, math &amp; engineering concepts</td>
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<td>4 Nano &amp; Micro Technology Experiments Using Static Charges</td>
<td>Learn about miniaturization &amp; measurement, definition of nano, nanotechnology, soap bubbles &amp; static charge, robotic gear trains, computer switches &amp; gates, sensors, circuits, charge storage, build &amp; program charge generators, Maple-seed flying robots</td>
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<tr>
<td>5 Geometry &amp; Nano Math</td>
<td>Trigonometry, triangle, nano math concepts, gear trains, robots</td>
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Course Director: Prof. Dean M. Aslam, Electrical and Computer Engineering, Michigan State University  

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<th>Learning Area</th>
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<td>6    Build Your Robot using Microcontroller Prog.</td>
<td>Programming in C, compiling C code &amp; downloading into microcontrollers, building robots, system integration</td>
<td>7 - 12</td>
<td>Fig. 6</td>
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<td>7    High Definition Video</td>
<td>Shooting &amp; editing high definition video, video reporting</td>
<td>4 – 12</td>
<td>Fig. 7</td>
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Fig. 1 Programmable robots developed at MSU: MFRs are being developed and will use microcontrollers in the near future (these will benefit from worked depicted in Fig. 6).

Fig. 2 RFID technology using NXT robot

Fig. 3 Understanding DNA and base pairs using LEGOS.

Part of a DNA model.

Fig. 4 Understanding DNA and base pairs using LEGOS.

Fig. 5 Static charge sensors (SCS); mechanical and electronic

Fig. 6 Lego Gear Train demonstrates nano-dimensions, nanomath,
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**Fig. 4** Studying nano-dimensions, nanotechnology and sensors (micro/nano) using gear trains, static charges and LEGOs.

**Fig. 5** Trigonometry (example: $\sin \theta = \# \text{ of holes along beam } b / \# \text{ of holes along beam } c$) and nanomath.

**Fig. 6** Microcontroller programming; build robot from scratch using LEGOS.

**Fig. 7** HD video shooting and editing.