Educational Objectives:

Upon completion of this course, participants should be able to:

- Explain the advantages and disadvantages of high-field MRI;

- Describe recent advances in perfusion MRI, diffusion MRI and MRS;

- Describe the state of knowledge regarding functional connectivity MRI and susceptibility-weighted MRI;

- Describe potential clinical utility of functional connectivity MRI and susceptibility-weighted MRI;

- Explain recent advances in ^{23}Na MRI and MRS; and

- Explain recent advances in ^{13}C MRS.

Time	Title	Presenter
	High Field (3T>7T)	
09:00	Patient Safety	Michael Bock, Ph.D.
09:30	RF Coils	Lawrence L. Wald, Ph.D.
10:00	Portability of Clinical Protocol (Conventional Sequences)	Peter G. Morris, Ph.D.
10:30	Break/Meet the Teachers until 10:45	
	Non-Conventional Sequences	
11:00	Perfusion	Sardha Lalith Talagala, Ph.D.
11:30	Diffusion	Susumu M. Mori, Ph.D.
12:00	MR Spectroscopy	Peter B. Barker, D.Phil.
12:30	Break/Meet the Teachers until 12:45	
	Functional Connectivity	
14:00	Basics (Neural Networks, Neurophysiology)	Stefan Sunaert, M.D., Ph.D.
14:30	Clinical Use of fcMRI	Francesco Di Salle, M.D.
	Magnetic Susceptibility Contrast	
15:00	Basics (Sources of Susceptibility, Pulse Sequence)	Jeff H. Duyn, Ph.D.
15:30	Clinical Use of SWI	Toshiaki Taoka, M.D., Ph.D.
16:00	Break/Meet the Teachers until 16:15	
	Non-Proton MR	
16:30	^{23}Na MRI/MRS	Matilde Inglese, M.D., Ph.D.
17:00	^{13}C MRS	Brian D. Ross, Ph.D. & Napapon Sailasuta, Ph.D.
17:30	Adjournment/Meet the Teachers until 18:00	

Saturday, 7 May	Body MRI: Clinical Practice of Today & Tomorrow	
08:00–17:15 Room: 516A-C	Organizers: Shahid M. Hussain, M.D., Caroline Reinhold, M.D. & Evis Sala, M.D., Ph.D., F.R.C.R.	Skill Level: Basic to Intermediate

Educational Objectives:

Upon completion of this course, participants should be able to:

- Describe the indications and results of MRI of liver and renal masses;

- Understand and apply the basic MRI protocol at 1.5T;

- Recognize challenges and review solutions for body MRI at 3T;

- Describe MRCP and the common biliary tree abnormalities;

- Explain current results of MRI to diagnose and stage rectal cancer and uterine malignancies;

- Describe the multi-parametric approach to prostate carcinoma;

- Design body diffusion imaging protocol; and

- Describe current pertinent MRI findings for benign and malignant uterine lesions.

Time	Title	Presenter
08:00	Abdominal MRI: Protocol Optimization-Tips & Tricks	Bachir Taouli, M.D.
08:30	MR Contrast Media & Safety Aspects	Diego R. Martin, M.D., Ph.D.
09:00	Diffusion Imaging: Pertinent Body Applications	Dow-Mu Koh, M.D., M.R.C.P.
09:30	New Advances in 3T Body MRI: A Paradigm Shift?	Shahid M. Hussain, M.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	MRI of the Renal Lesions	Ivan Pedrosa, M.D.
11:00	Biliary Tree Disorders: How to Evaluate on MRI & MRCP	Kartik S. Jhaveri, M.D.
11:30	MRI of the Liver: Pre- & Post-Transplantation Evaluation	Reena C. Jha, M.D.
12:00	Break/Meet the Teachers until 12:15	
13:30	Rectal Cancer Staging: A Practical Approach	Gina Brown, M.D., M.R.C.P., F.R.C.R.
14:00	Small Bowel MRI: Technique & Common Abnormalities	Michael A. Patak, M.D.
14:30	MRI of the Pancreas: Better than CT?	Aytekin Oto, M.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Multi-Parametric MRI of the Prostate	Masoom A. Haider, M.D., F.R.C.P.C.
16:00	Benign Uterine Abnormalities	Susan M. Ascher, M.D.
16:30	Malignant Uterine Abnormalities	Evis Sala, M.D., Ph.D., F.R.C.R.
17:00	Adjournment/Meet the Teachers until 17:15	

Saturday, 7 May	Molecular & Cellular Imaging
08:30–17:15 Room 511A-C	Organizers: Jeff W. M. Bulte, Ph.D. & Willem M. Mulder, Ph.D.

Skill level:
Intermediate to Advanced

Educational Objectives:

Upon completion of this course, participants should be able to:

• Describe the basic concepts that enable molecular and cellular imaging;

• Describe the currently used contrast agents, molecular probes, and reporter genes;

• Describe how molecular and cellular imaging is important to obtain a better understanding of the biological processes underlying certain diseases; and

• Describe the steps that are necessary for clinical translation.

Time	Title	Presenter
08:30	Nanomedicine & Molecular Imaging	John Frangioni, M.D., Ph.D.
09:00	DIACEST Agents & Sensors	Assaf A. Gilad, Ph.D.
09:30	PARACEST Agents & Sensors	Elena Vinogradov, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	NON-CEST Biosensors	Angelique Louie, Ph.D.
11:00	siRNA Delivery & Imaging	Anna V. Moore, Ph.D.
11:30	Advances in Preclinical Tracking	Paula J. Foster, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
13:30	MRI Reporter Genes	Glenn A. Walter, Ph.D.
14:00	MR Imaging of Allograft Rejection	Yijen Lin Wu, Ph.D.
14:30	Cerebral Gene Transcript Quantification *In Vivo* using MRI	Philip Liu, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Lipoprotein-Derived Multimodal Nanoparticles	David P. Cormode, Ph.D.
16:00	Clinical Cell Tracking Using PET	Shahriar Yaghoubi, Ph.D.
16:30	Clinical Cell Tracking Using MRI	Piotr Walczak, M.D.
17:00	Adjournment/Meet the Teachers until 17:15	

Educational Objectives:

Upon completion of this course participants should be able to:

- List the essential pre and post processing steps in functional MRI;Describe the rationale behind each of the pre and post processing steps;

- Select a functional MRI processing strategy that is optimal for their study;

- Contrast univariate vs. multivariate approaches;

- Contrast model-based vs. exploratory approaches;

- Describe the methods and challenges associated with comparing populations;

- List the advantages and limitations of diffusion tensor MRI;

- Identify sources of artifact in assessing large and small anatomic changes; and

- Describe what anatomic analyses are robustly used in the clinical realm.

Time	Title	Presenter
	Functional Data Analysis	
08:00	Preprocessing: What's Done & Why	Jesper Andersson, Ph.D.
09:00	Post Processing: What are the Current Methods	Stephen C. Strother, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	Univariate vs. Multivariate Approaches	Xiaoping P. Hu, Ph.D.
11:00	Model Based vs. Exploratory	James J. Pekar, Ph.D.
11:30	fMRI Analysis in the Clinical Realm	Stefan Sunaert, M.D., Ph.D.
12:00	Break/Meet the Teachers until 12:15	
	Anatomic Data Analysis	
13:30	Comparing Populations (Subcortical Structures)	Michael I. Miller, Ph.D.
14:00	Comparing Populations 2 (Cortical Structures)	Pierre Fillard, Ph.D.
14:30	Diffusion Tensor MRI - Beyond Tractography	Gordon L. Kindlmann, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Measuring the Big Changes (Development, Alzheimers…)	David H. Salat, Ph.D.
16:00	Measuring Small Changes with Learning & Plasticity	Jason P. Lerch, Ph.D.
16:30	Image Analysis in the Clinical Realm	John A. Butman, M.D., Ph.D.
17:00	Adjournment/Meet the Teachers until 17:15	

Saturday, 7 May	MR Systems Engineering	
08:30–17:15 Room 512A-G	Organizers: Blaine A. Chronik, Ph.D. & Greig C. Scott, Ph.D.	Skill level: Intermediate to Advanced

Educational Objectives:

Upon completion of this course, participants should be able to:

• Recognize the basic hardware components of an MRI scanner and how they interact;

• Describe the basic methods for magnet, gradient, and shim design;

• List practical limitations in the construction of magnets, gradients, and shim systems;

• Identify and describe the basic mechanisms by which medical devices interact with the magnet and gradients within an MRI scanner; and

• Explain the RF electronic subsystems that interface with RF coils.

The final 5 minutes of each presentation will be reserved for questions

Time	Title	Presenter
System Overview & Magnets		
08:30	Overview of the MRI System	R. Scott Hinks, Ph.D.
09:00	Magnets: Theory	Darren Houlden, C.Phys., Minst.P., B.Sc.
09:30	Magnets: Reality	Ian Wilkinson, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
Shims & Gradients		
10:30	Shimming: Fields, Coils, & Control	Piotr M. Starewicz, Ph.D.
11:00	Gradient Coils: EM, Heating, & Mechanical	Richard W. Bowtell, Ph.D.
11:30	Gradient Amplifiers: Power & Control	Juan A. Sabate, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
Devices in the Scanner: Low Frequency Interactions		
13:30	Overview of Device Interactions	Blaine A. Chronik, Ph.D.
14:00	kHz (Gradient) Interactions	Paul M. Glover, Ph.D.
14:30	Modeling Low Frequency Interactions	TBA
15:00	Break/Meet the Teachers until 15:15	
RF Electronics		
15:30	RF Power Amps: Introduction	Frederick H. Raab, Ph.D.
16:00	RF Preamps	Ralph G. Oppelt, Ph.D.
16:30	Console Electronics	Pascal P. Stang, M.Sc.
17:00	Adjournment/Meet the Teachers until 17:15	

Educational Objectives:

Upon completion of this course participants should be able to:

- Describe how to use basic MRI, MRS and MRSI technologies in preclinical cancer research studies including studies of cells, tissue samples and animal models;

- Describe the principal applications of basic MRI, MRS and MRSI technologies in preclinical cancer research studies; and

- Describe how MRI, MRS and MRSI biomarkers of cancer are used for diagnosis of cancer, for therapy planning and for therapeutic outcome assessment.

Time	Title	Presenter
08:30	Tumor Metabolism	Kevin M. Brindle, D.Phil.
09:00	Tumor Physiology	Michal Neeman, Ph.D.
09:30	Tumor 'omics'	Robert J. Gillies, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	How to Study Cancer Cell Models	E. Jim Delikatny, Ph.D.
11:00	How to Perform MRI/MRS in Animal Models	Arend Heerschap, Ph.D.
11:30	Tumor Lipid Metabolism	Kristine Glunde, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
13:30	Tumor Energy Metabolism	Klaas Nicolay, Ph.D.
14:00	pH in Cancer	Sebastián Cerdán, Ph.D.
14:30	Molecular Imaging in Cancer	Zaver M. Bhujwalla, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Tumor Vasculature	Simon P. Robinson, Ph.D.
16:00	Imaging Cancer Treatment Response Using Diffusion-weighted MRI	Brian D. Ross, Ph.D.
16:30	Detecting Specific Drug Responses	Sabrina M. Ronen, Ph.D.
17:00	Adjournment/Meet the Teachers until 17:15	

Educational Objectives:

Upon completion of this course, participants should be able to:

- Decide if diffusion and perfusion acquisitions would be useful in addressing their scientific and clinical questions;

- Optimize experimental protocols for diffusion and perfusion MRI given the time limit of their scanning session;

- Describe the steps involved in the processing pipelines for diffusion and perfusion MRI data;

- Appraise potential pitfalls of diffusion and perfusion MRI's;

- Formulate biological interpretation of diffusion and perfusion MRI findings; and

- Recognize potential future clinical applications of these techniques as technology improves.

Time	Title	Presenter
Diffusion Imaging Techniques		
08:00	Measuring Diffusion with NMR, MRI & Other Methods	Peter J. Basser, Ph.D.
08:30	Diffusion-Weighted Sequences	Stefan T. Skare, Ph.D.
09:00	Diffusion Tensor Quantities & their Biological Interpretation	Derek K. Jones, Ph.D.
09:30	Experimental Design, Artifacts & Confounds	Alexander L. G. Leemans, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	Tractography Methods	Saâd Jbabdi, Ph.D.
11:00	Non-Gaussian Diffusion & its Biological Interpretation	Yaniv Assaf, Ph.D.
11:30	Group Analysis & Atlases	Gary Hui Zhang, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
Perfusion Imaging Acquisition & Flow Regulation		
13:30	Physiology of Microvasculature	Edith Hamel, Ph.D.
13:55	Introduction & From Signal to Concentration	Peter Gall, Ph.D.
14:20	Arterial Input Function: Measurement, Delay & Dispersion	Fernando Calamante, Ph.D.
14:45	Deconvolution & Predictive Modeling	Søren Christensen, Ph.D.
15:10	Vessel-Size & Permeability Imaging	Emmanuel L. Barbier, Ph.D.
15:35	Break/Meet the Teachers until 15:50	
16:00	Physiology of Autoregulation	Linda Knutsson, Ph.D.
16:25	Introduction & Labeling Methods	Susan T. Francis, Ph.D.
16:50	Quantification of ASL	Esben T. Petersen, Ph.D.
17:15	Background Suppression & Read-Out Options	Matthias Günther, Ph.D.
17:40	Advanced ASL: Flow Territory Mapping, Reactivity & Pharmacological ASL	Jeroen Hendrikse, M.D., Ph.D.
18:00	Adjournment/Meet the Teachers until 18:15	

Saturday, 7 May	MR Physics for Physicists	
08:30–18:15 Room 710A	Organizers: Michael H. Buonocore, M.D., Ph.D., Michael Markl, Ph.D. & Andrew G. Webb, Ph.D.	Skill level: Intermediate to Advanced

Educational Objectives:

Upon completion of this course, participants should be able to:

- Derive equations used to describe spin and magnetization dynamics;

- Describe equations for modeling fast sequences and correcting motion artifacts;

- Explain models and methods for mapping of tissue characteristics and parameters; and

- Describe the physics for imaging with RF transmitter and receiver arrays.

Moderators: Michael H. Buonocore, M.D., Ph.D. & Michael Markl, Ph.D.

Time	Title	Presenter
	Spins & Magnetization	
08:30	Origins of the Equations Describing Spin & Magnetization Dynamics	Michael H. Buonocore, M.D., Ph.D.
09:00	Spin Density Matrix to Describe Spin Populations & Coherence Transfers	M. Albert Thomas, Ph.D.
09:30	Physical Mechanisms & Mathematical Models of Spectral-Edited MRS	Changho Choi, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
	Imaging Equationås	
10:30	Spin Phase Graphs & the Analysis of Echo Formation & Signal Contrast	Matthias Weigel, Ph.D.
11:00	Modeling of Fast Sequences Not in Equilibrium	Carl Ganter, Ph.D.
11:30	Equations for Imaging with Hyperpolarized Agents	Sean B. Fain, Ph.D.
12:00	Break/Meet the Teachers until 12:45	
13:30	Mathematical Models for Retro- & Prospective Motion Correction	Maxim Zaitsev, Ph.D.
	Tissue Parameter Mapping	
14:00	Modern Methods for Accurate T1, T2 & Proton Density Mapping	Sean C. L. Deoni, Ph.D.
14:30	Contrast Mechanisms Using SSFP Sequences	Jongho Lee, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Tissue Characterization Using MR Elastography	John B. Weaver, Ph.D.
16:00	Methods & Models for Assessing the Physical Characteristics of Short T2 & T2* Tissues	Michael Garwood, Ph.D.
	Imaging Physics	
16:30	Modeling, Mapping, & Application of RF Transmit Fields	Peter Börnert, Ph.D.
17:00	Optimal Coil Combination & Reconstruction Using Receiver Arrays	Felix Breuer, Ph.D.
17:30	Traveling Wave RF Excitation & Reception	David O. Brunner
18:00	Adjournment/Meet the Teachers until 18:15	

| **09:00–17:15**
Room 510 | Organizers:
Nicola De Stefano, M.D., Ph.D., Marco Essig, M.D., Ph.D.,
Nadine J. Girard, M.D., Jeffrey Joseph Neil, M.D., Ph.D.
& Afonso C. Silva, Ph.D. | Skill Level:
Intermediate to Advanced |

Educational Objectives:

Upon completion of this course, participants should be able to:

- Interpret cerebral malformations on MRI;
- Apply MRI to evaluation of pediatric epilepsy;
- Interpret pediatric brain tumors on MRI;
- Describe the pathology underlying MRI findings in multiple sclerosis;
- Interpret MRI findings in patients with multiple sclerosis;
- Describe the application of MRI methods to dementias (Alzheimer's disease, HIV, and prion disease);
- Describe appropriate situations for the application of conventional MRI to traumatic brain injury; and
- Describe appropriate application of advanced MRI (functional connectivity MRI and DTI) to traumatic brain injury.

Time	Title	Presenter
Pediatric Diseases		
09:00	Cerebral Malformations	Bernard S. Chang, M.D.
09:30	Epilepsy	Charles A. Raybaud, M.D., Ph.D.
10:00	Pediatric Tumors	Nadine J. Girard, M.D.
10:30	Break/Meet the Teachers until 10:45	
Multiple Sclerosis		
11:00	Lesions of the White Matter	Alex Rovira, M.D.
11:30	Lesions of the Gray Matter	Jeroen Geurts, Ph.D.
12:00	Normal Appearing Brain	Maria A. Rocca, M.D.
12:30	Break/Meet the Teachers until 12:45	
Dementias		
13:30	Alzheimer's Disease	Douglas L. Arnold, M.D.
14:00	HIV	Beau M. Ances, M.D., Ph.D.
14:30	Prion Diseases	Alberto Bizzi, M.D.
15:00	Break/Meet the Teachers until 15:15	
TBI		
15:30	Acute Evaluation (CT or MRI?)	Pratik Mukherjee, M.D., Ph.D.
16:00	MRI Evaluation of Blast-Related TBI	David L. Brody, M.D., Ph.D.
16:30	fcMRI/DTI Applied to TBI	Jill V. Hunter, M.D.
17:00	Adjournment/Meet the Teachers until 17:15	

| **08:30–17:45**
Room 516A-C | Organizers:
Christine Chung, M.D., Bernard J. Dardzinski, Ph.D.,
& Hollis G. Potter, M.D. | **Skill level:**
Intermediate |

Educational Objectives:

Upon completion of this course, participants should be able to:

- Identify common clinical presentations of the injured athlete and indications for imaging;
- Select appropriate MR protocols for specific clinical needs;
- Determine various diagnoses on the basis of MR findings in the athlete; and
- Identify MR findings that are important in characterization of sports injuries and that may alter treatment.

Morning Session

Time	Title	Presenter
Moderator: Hollis G. Potter, M.D.		
08:30	Clinical Evaluation of the Throwing Shoulder	Andrew D. Pearle, M.D.
09:00	MR Evaluation of the Throwing Shoulder	Lawrence M. White, M.D., F.R.C.P.C.
09:30	Clinical Evaluation of the Throwing Elbow	Andrew D. Pearle, M.D.
10:00	MR Evaluation of the Throwing Elbow	Christine Chung, M.D.
10:30	Break/Meet the Teachers until 10:45	
10:50	Pediatric Sports Injury	Diego Jaramillo, M.D., M.P.H.
11:25	Wrist/ Hand (Gymnast-Golfer)	Kimberly K. Amrami, M.D.
12:00	Break/Meet the Teachers until 12:15	

Afternoon Session

Time	Title	Presenter
Moderator: Timothy J. Mosher, M.D.		
14:00	Clinical Evaluation of the Unstable Knee	Mark L. Burman, M.D., F.R.C.P.C., C.S.P.Q.
14:30	Knee Ligament Insufficiency & Instability	Hollis G. Potter, M.D.
15:00	Ankle Impingement Syndromes	James M. Linklater, M.D., M.B.B.S.
15:30	Break/Meet the Teachers until 15:45	
16:00	Hockey Hip	Timothy J. Mosher, M.D.
16:30	Pubalgia	Philip Robinson, M.D.
17:00	Muscle Injuries	Richard Kijowski, M.D.
17:30	Adjournment/Meet the Teachers until 17:45	

08:30–16:55 Room 511A-C	Organizers: Kevin M. Brindle, D.Phil. & Geoffrey J. M. Parker, Ph.D.	Skill level: All Levels

Educational Objectives

Upon completion of this course, participants should be able to:

- Identify the key points in the drug discovery and development process where MR can have an impact;

- Define an imaging biomarker;

- Describe the role of MR in drug discovery and development for a range of disease areas;

- Identify competing and complementary technology; and

- Recognize opportunities for MR research at the pharmaceutical industry – academic interface.

Time	Title	Presenter
08:30	The Drug Development Pathway	John C. Waterton, Ph.D.
09:00	Biomarkers, Endpoints, Validation & Qualifications	Jeffrey L. Evelhoch, Ph.D.
09:30	The Roles of Animal & Human Imaging	Markus Rudin, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	Cancer	Theodore Pellas, V.M.D., Ph.D.
11:00	Musculoskeletal Diseases	Arend Heerschap, Ph.D. Hermien E. Kan, Ph.D., Co-author
11:30	Cardiovascular Diseases	Chun Yuan, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
13:30	Neurology & Psychiatry	Richard Hargreaves, Ph.D.
14:00	Respiratory Diseases	Lars E. Olsson, Ph.D.
14:30	Other Diseases & Areas of Unmet Needs	Didier Laurent, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Competing & Complementary Modalities & Measurements	Patricia E. Cole, M.D., Ph.D.
16:10	Industry-Academia Partnerships & Precompetitive Thinking	Steven C. R. Williams, Ph.D.
16:40	Adjournment/Meet the Teachers until 16:55	

Sunday, 8 May	Cardiovascular MR Imaging: Clinical Needs & Research Promises	
08:00–18:00 **Room 511D-F**	Organizers: Tim Leiner, M.D., Ph.D., Mitsue Miyazaki, Ph.D. & David E. Sosnovik, M.D.	Skill Level: Basic to Intermediate

MORNING SESSION

Educational Objectives

Upon completion of this course, participants should be able to:

- Describe what clinicians want to learn from a cardiovascular MR study;

- Explain physical principles of commonly used cardiovascular MR techniques; and

- Describe recent technical developments in the field of cardiovascular MR and how these developments (may eventually) impact clinical care.

Morning Session   *Moderators: Sonia Nielles-Vallespin, Ph.D. & David E. Sosnovik, M.D.*

Time	Title	Presenter
08:00	Introduction	
Evaluation of Cardiac Function		
08:05	Clinical Needs: What Do We Want to See?	Christopher M. Kramer, M.D.
08:25	Technical Foundations: How is it Done?	Orlando P. Simonetti, Ph.D.
08:45	Research Promises: What Can We Expect in the Future?	Frederick H. Epstein, Ph.D.
Evaluation of Cardiac Perfusion		
09:05	Clinical Needs: What Do We Want to See?	Jeanette Schulz-Menger, M.D.
09:25	Technical Foundations: How is it Done?	Michael Jerosch-Herold, Ph.D.
09:45	Research Promises: What Can We Expect in the Future?	Peter Kellman, Ph.D.
10:05	Break/Meet the Teachers until 10:20	
Evaluation of Cardiac Viability		
10:20	Clinical Needs: What Do We Want to See?	Subha V. Raman, M.D.
10:40	Technical Foundations: How is it Done?	Graham A. Wright, Ph.D.
11:00	Research Promises: What Can We Expect in the Future?	Sonia Nielles-Vallespin, Ph.D.
Evaluation of the Coronary Arteries		
11:20	Clinical Needs: What Do We Want to See?	Hajime Sakuma, M.D.
11:40	Technical Foundations: How is it Done?	Reza Nezafat, Ph.D.
12:00	Research Promises: What Can We Expect in the Future?	Matthias Stuber, Ph.D.
12:20	Break/Meet the Teachers until 12:35	

Continued on next page

AFTERNOON SESSION (Continued from previous page)

Afternoon Session		Moderators: Tim Leiner, M.D., Ph.D. & Mitsue Miyazaki, Ph.D.
Time	**Title**	**Presenter**
	Evaluation of Flow	
13:30	Clinical Needs: What Do We Want to See?	Michael D. Hope, M.D.
13:50	Technical Foundations: How is it Done?	Jos J. M. Westenberg, Ph.D.
14:10	Research Promises: What Can We Expect in the Future?	Michael Markl, Ph.D.
	3T Cardiac MRI	
14:30	What Does 3T Have to Offer?	Bernd J. Wintersperger, M.D.
14:50	Technical Solutions for 3T	Michael Schär, Ph.D.
15:10	Experimental & Hybrid Systems: 3T & Beyond	David E. Sosnovik, M.D.
15:30	Break/Meet the Teachers until 15:45	
	Cost-Effectiveness of Cardiac MRI	
15:45	Introduction: Why is this Important?	Rory Hachamovitch, M.D.
16:05	When Do I Use MR & When Do I Use CT?	Carlos E. Rochitte, M.D.
16:25	MR, CT & PET in Perspective	Zahi A. Fayad, Ph.D.
	Magnetic Resonance Angiography	
16:45	Peripheral Vascular Disease	Tim Leiner, M.D., Ph.D.
17:05	Non-Contrast Enhanced MRA	Vivian S. Lee, M.D., Ph.D., M.B.A.
17:25	3T & Beyond: What is There to Gain?	Saskia G. C. van Elderen, M.D.
17:45	Adjournment/Meet the Teachers until 18:00	

08:30-17:15
Room 512A-G

Organizers:
Tamer S. Ibrahim, Ph.D., Andrew G. Webb, Ph.D.
& Steven M. Wright, Ph.D.

Skill level:
Advanced

Educational Objectives

Upon completion of this course, participants should be able to:

- Describe the basic theory, design and construction of single and multi-tuned RF coils and their feed networks;

- Explain the principles of operation and basic applications of receive and transmit RF coil arrays;

- Compare the major methods of RF modeling commonly in use and the relative advantages and disadvantages of each; and

- Describe the interaction of the RF signals used for MRI with other devices that may be used in the MR environment, such as implantable devices, EEG and EEG devices, PET detectors and NIR sensors.

Time	Title	Presenter
	RF Basics	
08:30	Circuit & Transmission Lines	Steven M. Wright, Ph.D.
09:00	Volume & Surface Coils	Dennis W. J. Klomp, Ph.D.
09:30	Multi-Tuned Coils	Barbara L. Beck, B.S.E.E., B.S.Ed.
10:00	Break/Meet the Teachers until 10:15	
	RF Arrays	
10:30	Receive Arrays	Nicola F. De Zanche, Ph.D.
11:00	Transmit Arrays	J. Thomas Vaughan, Jr., Ph.D.
11:30	RF Modeling	Tamer S. Ibrahim, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
	RF Interference with Other Devices	
13:30	Implantable Devices	Ross D. Venook, Ph.D.
14:00	EEG NIR PET	Giorgio Bonmassar, Ph.D.
14:30	ECG	Thoralf Niendorf, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
	Live Construction of Coils	
15:30	Human	Hiroyuki Fujita, Ph.D.
16:30	Adjournment/Meet the Teachers until 16:45	

Educational Objectives

Upon completion of this course, participants should be able to:

- Explain the challenges of clinical cancer diagnosis and management and of drug development using specific examples;

- Compare the relative contribution of modern imaging tools via improved technological developments and biological understanding;

- Address clinical issues faced by practicing physicians and clinic supporting scientists in the interpretation of imaging results; and

- Illustrate how imaging tools can aid in new drug development, treatment response evaluation and for changing patients outcomes.

Time	Title	Presenter
08:30	Bottlenecks in Patient Cancer Journeys	Shih-Chang Wang, M.D.
09:00	Pseudoprogression & Pseudoregression - What's Going On?	Meng Law, M.D., M.B.B.S., F.R.A.C.R.
09:30	Improving Head & Neck Radiation Outcomes with Oxygenation Imaging	Bernard Gallez, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
10:30	Advances in Imaging of Esophageal Cancer	Angela M. Riddell, M.D.
11:00	The Difficult Liver with Cancer - Diagnosis with MRI	Richard C. Semelka, M.D.
11:30	Indeterminate Renal Masses - Role for MRI	Ali Guermazi, M.D.
12:00	Break/Meet the Teachers until 12:15	
13:30	Pancreas - Cancer or Inflammation?	Celso Matos, M.D.
14:00	Prostate Cancer - Integrating Multiparametric MRI into Practice	Jurgen J. Fütterer, M.D., Ph.D.
14:30	Incidental Pelvic Lesions in the Oncology Patient: Investigate, Follow, Ignore?	Aliya Qayyum, M.D.
15:00	Break/Meet the Teachers until 15:15	
15:30	Assessing the Burden of Disease with Whole Body MRI	Heinz-Peter W. Schlemmer, M.D., Ph.D.
16:00	Bony Metastases - Assessing Response to Therapy	Anwar R. Padhani, M.R.C.P., F.R.C.R.
16:30	Monitoring Physical Therapies Using MRI	Masoom A. Haider, M.D., F.R.C.P.C.
17:00	Adjournment/Meet the Teachers until 17:15	

MORNING SESSION

Educational Objectives

Upon completion of this course, participants should be able to:

- Describe the shortcomings of conventional fMRI acquisition techniques and identify state-of-the-art methods for overcoming these issues;

- Identify alternative contrast mechanisms for detecting brain activity using MRI;

- Explain why fMRI signal changes can be difficult to interpret, and techniques that ameliorate interpretation confounds;

- Describe the basic phenomena observed in functional connectivity fMRI experiments and the spatial and temporal characteristics of intrinsic synchronous fluctuations;

- Evaluate the strengths and weaknesses of available techniques for defining synchronous brain regions and using them to infer the structure of brain networks; and

- Identify and describe several major findings that relate task-absent fMRI signal to clinical and basic neuroscience, and evidence that these signals reflect connectivity in the brain.

Time	Title	Presenter
	Advanced fMRI Techniques: Acquisition	
08:00	Going 3D: Volumetric Acquisition Methods	David Feinberg, M.D., Ph.D.
08:20	Multi-Echo Acquisition	Benedikt A. Poser, Ph.D.
08:40	Parallel & Inverse Imaging Techniques	Fa-Hsuan Lin, Ph.D.
09:00	Prospective Correction of Motion & Artifacts	Maxim Zaitsev, Ph.D.
09:20	Translating High Field into High Resolution	Jonathan R. Polimeni, Ph.D.
09:40	Real Time fMRI	Stephen M. LaConte, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
	Advanced fMRI Techniques: Contrast	
10:30	Spin-Echo Techniques	Noam Harel, Ph.D.
10:50	Steady-State Free Precession Techniques	Jongho Lee, Ph.D.
11:10	Improving Interpretability: ASL & VASO	Manus J. Donahue, Ph.D.
11:30	Calibrated fMRI	Yihong Yang, Ph.D.
11:50	What Can MRS Tell Us about Brain Activity?	Wei Chen, Ph.D.
12:10	Can MRI Detect Neuronal Activity Directly?	Allen W. Song, Ph.D.
12:30	Break/Meet the Teachers until 12:45	

Sunday, 8 May	**Advanced fMRI Techniques & Functional Connectivity Assessment**	
08:00–17:15 Room 520B-F	Organizers: Peter A. Bandettini, Ph.D. & Karla L. Miller, Ph.D..	**Skill level: Advanced**

AFTERNOON SESSION (Continued from previous page)

Time	Title	Presenter
	Functional Connectivity	
13:30	What is the State of the Field?	Michael D. Greicius, M.D., M.P.H.
14:00	Characteristics of Resting State Fluctuations	David A. Leopold, Ph.D.
14:30	Break/Meet the Teachers until 14:45	
15:00	Seeds vs ICA: How to Analyze Data	Christian F. Beckmann, Ph.D.
15:20	Multi-Modal Fluctuations & Correlations	Helmut Laufs, M.D.
15:40	Nonstationarity of Resting State Signal	Catherine E. Chang, M.S.
16:00	Causality from fMRI? Yes!	Alard Roebroeck, Ph.D.
16:20	Causality from fMRI? No!	Olivier David, Ph.D.
16:40	Clinical & Neuroscience Applications	Jessica S. Damoiseaux, Ph.D.
17:00	Adjournment/Meet the Teachers until 17:15	

Educational Objectives

Upon completion of this course, participants should be able to:

- Name examples of different data collection strategies, and their uses;

- Design pulse sequences for a given application, to achieve the desired contrast;

- Describe approaches to address patient and physiologic motion;

- Explain some of the different methods of acceleration, their advantages and disadvantages;

- Identify the basic differences between conventional and more recent methods of image reconstruction (e.g. constrained reconstruction methods); and

- Explain how different acquisition and reconstruction methods can be used to acquire quantitative parametric images in addition to morphology.

Time	Title	Presenter
	General Pulse Sequences Strategies	
08:30	Echo-Train Sequences: EPI, 2D RARE & 3D Strategies	David C. Alsop, Ph.D.
09:00	Steady-State Sequences: Spoiled & Balanced Methods	Karla L. Miller, Ph.D.
09:30	Magnetization Preparation for Contrast Manipulation & Beyond	Daniel A. Herzka, Ph.D.
10:00	Break/Meet the Teachers until 10:15	
	Pulse Sequence Tools	
10:30	RF Pulse Toolkit: Different Pulses for Different Needs	William A. Grissom, Ph.D.
11:00	Motion Sensitized MR: ASL, Diffusion, Phase Contrast & MR Elastography	Derek K. Jones, Ph.D.
11:30	Motion Compensation Strategies	David Atkinson, Ph.D.
12:00	Break/Meet the Teachers until 12:15	
	Tools for Rapid Imaging	
13:30	Acceleration Through Alternate Trajectories	James G. Pipe, Ph.D.
14:00	Parallel Imaging: Principles & Implementation	Nicole E. Seiberlich, Ph.D.
14:30	Reconstruction Methods for Undersampled Data	Jeffrey A. Fessler, Ph.D.
15:00	Break/Meet the Teachers until 15:15	
	Imaging Beyond Morphology	
15:30	Temporal & Parametric Undersampling Strategies	Michael S. Hansen, Ph.D.
16:00	Techniques for MR Parameter Mapping & Quantitative Imaging	Stefanie Remmele, Ph.D.
16:30	Dynamic Contrast Enhanced Perfusion in the Brain & Body	Thomas E. Yankeelov, Ph.D.
17:00	Adjournment/Meet the Teachers until 17:15	