Bachelor of Honours

ACADEMIC CALENDAR
&
COURSE PLAN

2013-2014

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রাজশাহী কলেজ: পদার্থবিজ্ঞান বিভাগ

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সংক্ষিপ্ত ইতিহাস:

ঐতিহ্যবাহী রাজশাহী কলেজ, ১৮৭৩ সালে প্রতিষ্ঠিত হয়। এ সালের ১ এপ্রিল মাত্র ৬জন ছাত্র নিয়ে ১ম বর্ষ ও ২য় বর্ষ, এফ,এ (ফার্স্ট আর্টস) ক্লাস শুরু হয় যা ১৯০৮ সাল পর্যন্ত চলে। ১৯০৯ সালে আই,এস-সি কোর্স চালু হয়। প্রথম অধ্যক্ষ হিসেবে দায়িত্ব পালন করেন বোয়ালিয়া স্কুলের প্রথম শিক্ষক বাবু হরগোবিন্দ সেন।

১৮৭৭ সালে রাজশাহী কলেজ ডিগ্রী ক্লাস খোলার অনুমতি পাওয়ায় ১৮৭৮ সালে বিএসসি ক্লাস আরম্ভ হয়। প্রাপ্ত তথ্য মতে ১৮৮৭ সালের পূর্বেই রাজশাহী কলেজে কয়েকটি বিভাগে অনার্স কোর্স চালু হয়। ১৮৯৩ সালে অত্র কলেজে মাস্টার্স কোর্স চালু হয় এবং ১৯০৯ সালে মাস্টার্স কোর্সের অনুমোদন প্রত্যাহার করা হয়। পরবর্তীতে ১৯৯৩ সালে জাতীয় বিশ্ববিদ্যালয়ের অধীনে পুন:রায় মাস্টার্স কোর্স চালু হয়।

রাজশাহী কলেজে পদার্থবিজ্ঞান বিভাগ প্রতিষ্ঠার সঠিক সন, তারিখ জানা না গেলেও বিভিন্ন তথ্যের আলোকে অনুমান করা যায় যে, কলেজ প্রতিষ্ঠাকালীন সময় হতেই পদার্থ বিজ্ঞান বিষয়টি চালু ছিল। ১৮৮৭ বছরে বা সেশনে সৈয়দ আব্দুস সালেক নামক একজন ছাত্র কৃতিত্বের সাথে পদার্থ ও রসায়ন বিভাগে (এদুটি বিষয় তখন একটি বিষয় ছিল) অনার্স ডিগ্রী লাভ করেন বলে তথ্য পাওয়া যায়। প্রাপ্ত তথ্য হতে জানা যায় যে, ১৯১২-১৩ সেশনে পদার্থের ছাত্র সংখ্যা ছিল সর্বমোট ১৩৮ জন যাঁদের মধ্যে ইন্টারমিডিয়েটে ৮৬ জন, বিএ (পাস কোর্স) ৪১ জন এবং বিএসসি (পাস কোর্স ও অনার্স) ১১ জন। ঐ সেশনে শিক্ষক সংখ্যা ছিলেন ১.৫ জন এবং প্রদর্শক ছিলেন ২ জন। ১৯১২-১৩ সেশনে পদার্থবিজ্ঞানের শিক্ষক ছিলেন বাবু বালা চরন ভট্টাচার্য এবং তৎকালীন অধ্যক্ষ রায় কুমুদিনীকান্ত ব্যানার্জি বাহাদুর যাঁকে রাজশাহী কলেজের স্থপতি হিসেবে বিবেচনা করা হয়। তিনিও ছিলেন পদার্থবিজ্ঞানের প্রফেসর। তাঁর প্রচেষ্টায় ১৯১৫ সালে বর্তমান ফিজিক্স বিল্ডিংটি প্রতিষ্ঠিত হয়। ১৯৩০ পরবর্তী সময়ে বহুসংখ্যক খ্যাতিমান ব্যক্তিত্ব অত্র বিভাগের শিক্ষক হিসাবে কর্মরত ছিলেন; যাঁদের উলে-খযোগ্য কয়েকজন হলেন- সর্বজনাব এইচ সি. গাঙ্গুলী (১৯৩৪), মৌলভী আফতাবুদ্দীন আহমেদ, ড. আব্দুল-াহ আল-মুতি সরফুদ্দিন, ড. ছদর─দ্দীন আহমদ চৌধুরী, ড. মকবুলার রহমান সরকার

যাঁরা বর্তমানে কর্মরত আছেন:

সম্মানিত শিক্ষক মন্ডলী: (১) প্রফেসর আবু নোমান মো: আমীর আলী, বিভাগীয় প্রধান (২) নৃপেন্দ্র নাথ পাল, সহযোগী অধ্যাপক, (৩) ড. মোহা: আবু রেজোয়ান, সহযোগী অধ্যাপক, (৪) মোহা আলাউদ্দীন, সহযোগী অধ্যাপক, (৫) মো: দুরুল হোদা, সহকারী অধ্যাপক, (৬) মুহ: মাহফুজ হাসান, সহকারী অধ্যাপক, (৭) মো: তাজেমুল হক, সহকারী অধ্যাপক, (৮) জয় কুমার দাস, সহকারী অধ্যাপক, (৯) মো: রফিকুল ইসলাম, প্রভাষক (১০)প্রদর্শক শিক্ষক: দেওয়ান মো: খাইরুল ইসলাম ।

গ্যালারী দুটির একটি একাদশ বিজ্ঞান A-এর শ্রেণী কক্ষ হিসাবে এবং ল্যাবরেটরী গুলোর একটি যা ফিজিক্স বিল্ডিং এর নীচতলায় অবস্থিত তা উচ্চমাধ্যমিক শ্রেণীর ল্যাবরেটরী হিসাবে ব্যবহৃত হয়। উক্ত বিল্ডিং এর দোতলায় রয়েছে Optics Lab এবং ইলেকট্রিসিটি এন্ড ইলেকট্রনিক্স ল্যাব যে দুটি মূলত: ১ম বর্ষ অনার্স ও নন মেজর এবং ডিগ্রী পাস ২য় বর্ষ ও ৩য় বর্ষ অনার্স ল্যাব হিসাবে ব্যবহৃত হয়ে আসছে। ৩য় বিজ্ঞান ভবনের নিচতলায় অবস্থিত ল্যাবটি ৪র্থ বর্ষ অনার্স, মাস্টার্স ১ম পর্ব ও শেষ বর্ষ শিক্ষার্থীদের ল্যাব হিসাবে ব্যবহৃত হয়। অত্র বিভাগের ল্যাব সমূহ বেশ সমৃদ্ধ।

কেন্দ্রীয় গ্রন্থাগার ছাড়াও পদার্থবিজ্ঞান বিভাগের রয়েছে সেমিনার। সেমিনারে রয়েছে পদার্থবিজ্ঞান বিষয়ক বহুসংখ্যক বই যা শিক্ষার্থীরা সরাসরি পড়াশোনা করতে পারে আবার নিয়ম মাফিক ধার নিতেও পারে। এটি পরিচালনার জন্য একজন বিভাগের শিক্ষক এটি পরিচালনার দায়িত্ব পালন করেন।

বর্তমানে বিভাগে অধ্যায়নরত শিক্ষার্থীদের তালিকা (তালিকা-০১) নিচে প্রদান করা হলো।

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তালিকা-০১

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বর্ষ	ছাত্র/ছাত্রীর আসন সংখ্যা
একাদশ (বিজ্ঞান)	৩০০
দ্বাদশ (বিজ্ঞান)	৩০০
১ম বর্ষ (মেজর)	১০০
১ম বর্ষ (নন মেজর)	২৮০
২য় বর্ষ (মেজর)	১০০
২য় বর্ষ (নন মেজর)	২৮০
৩য় বর্ষ	১০০
৪র্থ বর্ষ	১০০
মাস্টার্স শেষ পর্ব	৮৫
মাস্টার্স ১ম পর্ব	৩৭
বিএসসি পাস ১ম বর্ষ	১০
বিএসসি পাস ২য় বর্ষ	১২
বিএসসি পাস ৩য় বর্ষ	১০

জাতীয় বিশ্ববিদ্যালয়ের অধীনে অনুষ্ঠিত পরীক্ষাসমূহে অত্র বিভাগের ফলাফল সন্তোষজনক।
নিম্নে কয়েক বছরের ৪র্থ বর্ষ অনার্স শ্রেণীর ফলাফলাফল নিম্ন রূপঃ

বছর	১ম শ্রেণী	২য় শ্রেণী	৩য় শ্রেণী	পাস	ফেল	মোট
2010	15	56	03	00	01	79
2009	08	51	13	01	03	84
2008	01	49	08	03	03	71
2007	07	52	08	05	03	81
2006	04	32	13	04	01	54

বিভাগের শিক্ষকমণ্ডলীর পরিচিতি

নাম	পদবী
১। আবু নোমান মো: আমীর আলী	অধ্যাপক ও বিভাগীয় প্রধান
২। নৃপেন্দ্র নাথ পাল	সহযোগী অধ্যাপক
৩। ড. মোহা: আবু রেজোয়ান	সহযোগী অধ্যাপক
৪। মোহা: আলাউদ্দীন	সহযোগী অধ্যাপক
৫। মো: দূরুল হোদা	সহকারী অধ্যাপক
৬। মুহ: মাহফুজ হাসান	সহকারী অধ্যাপক
৭। মো: তাজেমুল হক	সহকারী অধ্যাপক
৮। জয় কুমার দাস	সহকারী অধ্যাপক
৯। মো: রফিকুল ইসলাম	প্রভাষক
১০। দেওয়ান মো: খাইরুল ইসলাম	প্রদর্শক

কর্মচারিবৃন্দের পরিচিতি

মোঃ ইসমাইল হোসেন	কম্পিউটার অপারেটর
মোঃ আবুল কাসেম	এমএলএসএস
মোঃ আতিকুর রহমান	এমএলএসএস
মো: ফারুক হোসেন	এমএলএসএস

বিভাগের শ্রেণিভিত্তিক সমন্বয়কারী শিক্ষকগণের নাম

ক্রমিক নম্বর	বর্ষ	নাম
১।	প্রথম বর্ষ অনার্স	১. নৃপেন্দ্র নাথ পাল, সহযোগী অধ্যাপক
		১. জয় কুমার দাস, সহকারী অধ্যাপক
২।	দ্বিতীয় বর্ষ অনার্স	১. মোহা: আলাউদ্দীন, সহযোগী অধ্যাপক
		২. মোহা: রফিকুল ইসলাম, প্রভাষক
৩।	তৃতীয় বর্ষ অনার্স	১. ড. মো: আবু রেজোয়ান, সহযোগী অধ্যাপক
		২. মোহ: তাজেমুল হক, সহকারী অধ্যাপক
৪।	চতুর্থ বর্ষ অনার্স	১. মুহ: মাহফুজ হাসান, সহকারী অধ্যাপক
		২. জয় কুমার দাস, সহকারী অধ্যাপক
৫।	মাস্টার্স প্রথম পর্ব	১. মোহা: আলাউদ্দীন, সহযোগী অধ্যাপক
		২. মোহা: দুরুল হোদা, সহকারী অধ্যাপক
৬।	মাস্টার্স শেষ পর্ব	১. মো: দূরুল হোদা, সহকারী অধ্যাপক

		২.মোহা: মাহফুজ হাসান, সহকারী অধ্যাপক
৭.	ডিগ্রী (পাস)	১. নৃপেন্দ্র নাথ পাল, সহযোগী অধ্যাপক
		২. মোহা: রফিকুল ইসলাম, প্রভাষক
৮	দ্বিতীয় বর্ষ (নন মেজর)	১. নৃপেন্দ্র নাথ পাল, সহযোগী অধ্যাপক
		২. মোহা: আলাউদ্দীন, সহযোগী অধ্যাপক
		৩. মো: দূরুল হোদা, সহকারী অধ্যাপক
		৪. মুহ: মাহফুজ হাসান, সহকারী অধ্যাপক
		৫. মোহ: তাজেমুল হক, সহকারী অধ্যাপক
		৬. জয় কুমার দাস, সহকারী অধ্যাপক

একাডেমিক ক্যালেন্ডার

স্নাতক (অনার্স) পর্যায়

শিক্ষাবর্ষ : ২০১৪-২০১৫

(১০০ নম্বরের কোর্সের ৬০ ক্লাস ঘন্টা = ৪ ক্রেডিট, ৫০ নম্বরের কোর্সের ৩০ ক্লাস ঘন্টা = ২ ক্রেডিট)

১ম বর্ষ অনার্স			
পর্ব	ক্লাস (১৯০ কার্যদিবস)	পরীক্ষা	ফলাফল প্রকাশ
১ম ইনকোর্স	২২/০২/২০১৫ – ২৬/০৫/২০১৫ = ৬০ কার্যদিবস ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	২৭/০৫/২০১৫ ১০/০৬/২০১৫	---
২য় ইনকোর্স	১১/০৬/২০১৫ – ০৪/১০/২০১৫ = ৫৮ কার্যদিবস ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	০৫/১০/২০১৫ ১৯/১০/২০১৫	---
নির্বাচনী	২৮/১০/২০১৫ – ৩০/১১/২০১৫ = ২৮ কার্যদিবস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	০১/১২/২০১৫ ১৫/১২/২০১৫	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

২য় বর্ষ অনার্স			
পর্ব	ক্লাস	পরীক্ষা	ফলাফল প্রকাশ
১ম ইনকোর্স	ক্লাশ শুরুর তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুরুর ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

৩য় বর্ষ অনার্স			
পর্ব	ক্লাস	পরীক্ষা	ফলাফল প্রকাশ
১ম ইনকোর্স	ক্লাশ শুরুর তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুরুর ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

৪র্থ বর্ষ অনার্স			
পর্ব	ক্লাস	পরীক্ষা	ফলাফল প্রকাশ
১ম ইনকোর্স	ক্লাশ শুরুর তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুরুর ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

* কলেজ কর্তৃপক্ষ প্রয়োজনে যে কোন কার্যক্রম বা সময়সূচি পরিবর্তন করতে পারে।

শিক্ষার্থী ও অভিভাবকদের জ্ঞাতব্য

১। ব্যাচেলর (অনার্স) পরীক্ষায় অংশগ্রহণের যোগ্যতা হিসাবে মোট লেকচার ক্লাস/ব্যবহারিক ক্লাসের ৭৫% উপস্থিতি থাকতে হবে। বিশেষ ক্ষেত্রে অধ্যক্ষ বিভাগীয় প্রধানের সুপারিশের ভিত্তিতে উপস্থিতি ৭৫%-এর কম এবং ৬০% বা তার বেশি থাকলে তা বিবেচনার জন্য সুপারিশ করতে পারবেন। ৭৫% এর কম উপস্থিতির জন্য পরীক্ষার্থীকে পরীক্ষার ফরম পূরণের সময় ৫০০ (পাঁচশত) টাকা নন-কলেজিয়েট ফি অবশ্যই জমা দিতে হবে।

২। পরীক্ষার জন্য প্রেরিত পরীক্ষার্থীর আবেদনপত্রে অধ্যক্ষ/বিভাগীয় প্রধান প্রত্যয়ন করবেন যে-
   (i) পরীক্ষার্থীর আচরণ সন্তোষজনক;
   (ii) লেকচার ক্লাসে, ব্যবহারিক ক্লাসে, ইন-কোর্সে ও মাঠ পর্যায়ে তার উপস্থিতি সন্তোষজনক;
   (iii) পরীক্ষার্থী কলেজের সকল অভ্যন্তরীণ পরীক্ষায় উত্তীর্ণ হয়েছে এবং বিশ্ববিদ্যালয় কর্তৃক আরোপিত সকল শর্ত পূরণ করেছে।

৩। ক্লাস শিক্ষক নির্ধারিত কার্যক্রমে শিক্ষার্থীদের সক্রিয়ভাবে অংশগ্রহণ করতে হবে।

৪। জাতীয় বিশ্ববিদ্যালয়ের সিলেবাস ও কোর্সসমূহে কোন পরিবর্তন আসলে কলেজ কর্তৃপক্ষ তা বিবেচনায় আনবেন।

৫। ইনকোর্স পরীক্ষাসহ অন্যান্য পরীক্ষার নির্দিষ্ট তারিখে অংশগ্রহণে ব্যর্থ হলে পরবর্তিতে আর উক্ত পরীক্ষা দেয়ার সুযোগ থাকবে না।

৬। নির্ধারিত কোর্সের প্রতিটি অধ্যায় পাঠদান শেষে একটি করে ক্লাশ পরীক্ষা অনুষ্ঠিত হবে।

৭। নির্বাচনী পরীক্ষা সম্পূর্ণ কোর্সের উপর জাতীয় বিশ্ববিদ্যালয়ের চূড়ান্ত পরীক্ষামানে অনুষ্ঠিত হবে। নির্বাচনী পরীক্ষার ফলাফল আনুষ্ঠানিকভাবে প্রকাশ এবং ভাল ফলাফল অর্জনকারী ও ক্লাসে সর্বাধিক উপস্থিত শিক্ষার্থীদের পুরস্কৃত করা হবে।

৮। ছাত্র-ছাত্রীদের প্রত্যেক পরীক্ষার পূর্বে বেতন ও অন্যান্য ফি হালনাগাদ পরিশোধ করে প্রবেশপত্র সংগ্রহ করতে হবে।

৯। কোন শিক্ষার্থী কলেজের শৃঙ্খলা পরিপন্থী কোন কাজ করলে কর্তৃপক্ষ বহিষ্কারসহ আইনানুগ যে কোন শাস্তিমূলক ব্যবস্থা নিতে পারবেন।

১০। এই প্রতিষ্ঠানের নিয়মশৃঙ্খলা বজায় রাখতে এবং সবচেয়ে ভাল ফলাফল করতে সকল ছাত্র-ছাত্রীর প্রচেষ্টা ও অভিভাবকবৃন্দের সহযোগিতা আমাদের কাম্য।

১১। ধর্মীয় অনুষ্ঠানাদি চান্দ্রমাসের ওপর নির্ভরশীল হওয়ায় উল্লিখিত ছুটির তারিখ পরিবর্তিত হতে পারে।

১২। প্রয়োজনে যে কোন কার্যক্রম কর্তৃপক্ষ পরিবর্তন করতে পারে।

সহশিক্ষা কার্যক্রম ঃ

১. প্রতি শিক্ষাবর্ষের নবাগত শিক্ষার্থীদের 'রিসিপশন ও ওরিয়েন্টেশন' অনুষ্ঠানের মাধ্যমে বরণ।

২. বার্ষিক ক্রীড়া এবং সাহিত্য ও সাংস্কৃতিক প্রতিযোগিতায় শিক্ষার্থীদের অংশগ্রহণ।

৩. জাতীয় দিবসসমূহ উদযাপন ও বিভিন্ন প্রতিযোগিতায় শিক্ষার্থীদের অংশগ্রহণ।

৪. বিভাগের উদ্যোগে দেয়াল পত্রিকা ও স্মরণিকা প্রকাশ।

৫. বাংলা নববর্ষ, বসন্ত উৎসব, বর্ষাবরণ, সরস্বতী পূজা, রবীন্দ্র, নজরুল জয়ন্তী উদযাপনে শিক্ষার্থীদের অংশগ্রহণ।

৬. বনভোজন ও শিক্ষা সফরে শিক্ষার্থীদের অংশগ্রহণ।

৭. শিক্ষা বিষয়ক সেমিনারের আয়োজন।

৮. রোভার্স স্কাউটস ছাত্র-ছাত্রীদের আত্মনির্ভরশীল করে তোলার জন্য বিভিন্ন সামাজিক কার্যক্রমে অংশগ্রহণ।

৯. বিএনসিসি জাতীয় প্রতিরক্ষায় নিজেদের সম্পৃক্ত রাখার প্রত্যয়ে ছাত্র-ছাত্রীদের নিয়োজিত হওয়ার কার্যক্রম।

১০. বাঁধন স্বেচ্ছায় রক্তদান করে মানবতার সেবায় নিয়োজিত একটি সংগঠন।

১১. বরেন্দ্র থিয়েটার গ্রুপ থিয়েটার আন্দোলনভিত্তিক নাটক ও জীবনধর্মী চলচ্চিত্র বিষয়ক সংগঠন।

১২. অন্বেষণ জাতীয় পালাপার্বণে বিশুদ্ধ সাংস্কৃতিক চর্চার একটি সংগঠন।

১৩. আরসিডিসি (রাজশাহী কলেজ ডিবেটিং ক্লাব) ছাত্র-ছাত্রীদের মেধা বিকাশের জন্য বিতর্ক চর্চামূলক সংগঠন।

১৪. রাজশাহী কলেজ নাট্য সংসদ 'উদয়ের পথে আমরাও' এই ভাবনায় সৃষ্টিশীল ও ইতিবাচক নাট্য আন্দোলনে বিশ্বাসী এই সংগঠনটি আলো জ্বালানোর প্রত্যয় নিয়ে কাজ করছে।

১৫. রাজশাহী কলেজ সঙ্গীত চর্চা কেন্দ্রের উদ্যোগে শিক্ষার্থীদের সঙ্গীতসহ অন্যান্য বিষয় শেখানো হয়।

১৬. সরকারি প্রজ্ঞাপনের মাধ্যমে যে সব সহশিক্ষা কার্যক্রমের নির্দেশনা আসে তা আয়োজন করা।

COURSE PLAN
For
Honour's 1ˢᵗ year
Session: 2014-2015

Department of Physics

Rajshahi College,

Rajshahi

Contents
1st Year Honours

Paper Code	Paper Title	Marks	Credits
212701	Mechanics	75	3
212703	Properties of Matter, Waves & Oscillations	75	3
212705	Heat, Thermodynamics and Radiation	75	3
212706	Physics Practical-I	75	3
213709	Fundamentals of Mathematics	100	4
213711	Calculus-I	50	2
212807	Chemistry-I	100	4
212808	Chemistry-I Practical or	50	2
213607	Introduction to Statistics	100	4
213608	Statistics Practical-I	50	2
211501	History of the Emergence of Independent Bangladesh	100	4
	Total=	700	28

Department of Physics
Rajshahi College, Rajshahi

Course Code : **212701**
Course Title: **Mechanics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1.Nripendra Nath Pal **(NNP)**
2. Md. Durul Hoda **(DH)**
3. Md Mahfuj Hasan **(MH)**

Exam	Chapter	Content	Teachers	Lectures
1st In-course (20 Lectures)	1st	**1. Vector Algebra**: Vector and scalar quantities; Vectors and their components, Vector addition and subtraction, Scalar and vector triple products, scalar and vector fields, Vector differentiation and integration, Gradient, Divergence and Curl and their physical significance, Gauss's divergence theorem, Green's theorem and Stoke's theorem, Polar, Spherical and Cylindrical co-ordinates.	NNP	6
	2nd	**2. Concept of Measurement:** Different Measurement units, International system of units, Origin of Length mass and time, Conversion of units from one system to another.	DH	4
	3rd	**3. Particles Motion in one dimension:** Concept of motion and frame of reference, Position and displacement, Average velocity and average speed, Instantaneous velocity and speed, Acceleration, Constant acceleration, Equations for motion with constant acceleration, Free-fall acceleration, Equation for free-fall acceleration, Particles of physics and basic structure of atoms and nuclear.	MH	5
	4th	**4. Particles Motion in Two and Three Dimensions**: Position and displacement using vectors, Velocity and average velocity, Acceleration and average acceleration, Equation of motion using vector, Projectile motion, Uniform circular motion.	DH	5
2nd In-course (20 Lectures)	5th	**5. Force and Motion**: Newton's laws of motion and their applications, Concept of mass, Force and weight, Frictional forces and Properties of friction, Drag force and terminal speed, Forces of nature.	NNP	5
	6th	**6. Work, Energy and Power**: Kinetic and Potential energy, Work done by constant and variable forces, Work-energy theorem, Hooke's law, Work done by a spring force, Work done by weight, Power, Gravitational potential energy, Conservation of energy	DH	5
	7th	**7. System of Particles**: Center of mass of systems of particles, Center of mass of rigid bodies, Linear, momentum of a particle, Linear momentum of a system of particles, Conservation of linear momentum for a system of particles.	MH	5
	8th	**8. Collisions of Bodies**: Collisions and its classification, Impulse and linear momentum, Elastic and inelastic collision in one dimension, Motions of the center of mass of colliding bodies.	MH	5
Test (05) Lectures	9th	**9. Rotational Kinematics:** Translational and Rotational motion, Angular Position, Angular displacement, Angular Velocity and angular acceleration, Rotation with constant angular acceleration, Relation between linear and angular kinematics of a particles in circular motion.	NNP	3

	10th	**10. Rotational Dynamics:** Torque and angular momentum and their relation, Kinetic energy of rotation and rotational inertia (moment of inertia), Combined Translational and rotational motion of a rigid body, Parallel and perpendicular axes theorems of moment of inertia, calculation of moment of inertia for solids of different shapes, conservation of angular momentum. Relation between angular momentum and torque.	DH,MH	2
	1st to 10th	**Revision**		

Books Recommended:

1. এস.এম. মোকছেদ আলী   : Mechanics (বলবিদ্যা) ,
2. Spiegel, M.R. Resnick, R   : Vector Analysis
3. Halliday, D. and Walker, J: Fundamentals of Physics,
4. Halliday, D and Resnick, R. : Physics,
5. Sears, F.W., Zemansky, M.W and Young, H.D. : University Physics

Department of Physics
Rajshahi College, Rajshahi

Course Code : **212703**
Course Title: **Properties of Matter, Waves and Oscillations.**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Dr. Md. Abu Rejoan (AR)
2. Md. Alauddin (MA)
3. Md Tajemul Hoque (TH)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (20 Lectures)	1st	**1. Gravitation**: Kepler's Laws, Law of universal gravitation, G and its determination, Inertial and gravitational mass, Acceleration due to gravity and its variation, Measurement of acceleration due to gravity by compound pendulum and Kater's pendulum, Gravitational potential and field in simple cases, Gravitational potential energy.	AR	5
	2nd	**2. Elasticity**: Hooke's Law, Elastic constants of isotropic solids, Poisson's ratio and their interrelations, Internal elastic potential energy, Experimental determination of elastic constants, Torsion of a cylinder, Bending of beams, Cantilever, Variation of elasticity with temperature.	MA	5
	3rd	**3. Surface Tension**: Surface tension and surface energy, Adhesive and cohesive forces, Molecular theory of surface tension, Pressure on a curved membrane of uniform tension, Soap bubble, Capillarity, Angle of contact and its measurement, Determination of surface tension of water and mercury drop, Variation of surface tension with temperature.	TH	5
	4th	**4. Fluid Dynamics**: General concepts of fluid flow, Streamlines, Equation of continuity, Bernoulli's equation, Application of Bernoulli's equation and equation of continuity. Coefficient of viscosity, Critical velocity and Reynold's number, Poiseuille's formula and its correction, Measurement of viscosity, Variation of viscosity with temperature.	AR	5

Exam		Chapter	Content	Teachers	Lectures
2nd In-course (20 Lectures)	5th		**5. Waves**: Waves and Particles, Types of waves, Transverse and Longitudinal waves, Wavelength and frequency, The Speed of a traveling Wave, Wave speed on a stretched string, Energy and power of a traveling string wave, The principle of superposition for waves, Interference of waves, Complex waves, Standing waves and Resonance.	AR	6
	6th		**6. Sound Waves**: The Speed of Sound, Propagation and speed of longitudinal waves, Traveling longitudinal waves, Standing longitudinal waves, Beats, Doppler effect.	MA	7
	7th		**7. Oscillations**: Simple harmonic motion (SHM), Energy consideration in SHM, Applications of SHM, Relation between SHM and uniform circular motion, Combinations of two SHM's, Lissajous' figures, Two-body oscillations, Damped harmonic motion, Forced oscillations and resonance, Power and intensity of wave motion.	TH	7
Test(10 Lectures)	8th		**8. Vibrations**: Vibrations of string, Membranes, bars, plates and air-column, Sonometer, Melde's experiment, Rectangular and circular membranes, Transverse and longitudinal vibration of rod, Aircolumns in cylindrical pipes, Organ pipes, Chladni's figure	MA	5
	1st to 8th		**Revision**		

Books Recommended:

১. এস.এম. মোকছেদ আলী   : Properties of Matter, Waves and Optics
  2. Halliday, D, Resnick, R. and   : Fundamentals of Physics
   Walker, J.
  3. Halliday, D. Resnick, R.   : Physics
  4. Sears, F.W., Zemansky, M.W.
   and Young, H.D.   : University Physics
  5. Mathur, D.S.   : Properties of Matter
  6. Newman, F.W. and Searle, V.H.L   : General Properties of Matter.

Department of Physics
Rajshahi College, Rajshahi

Course Code : **212705**   Assigned Course Teacher:
Course Title: Heat, Thermodynamics & Radiation   1Joy Kumar Das (JKD)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour   2. Md. Rafiqul Islam (RI)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (20 Lectures)	1st	**1. Heat and Temperature:** Concept of temperature, Thermal equilibrium, Measurement of low and high temperatures, The Clausius & Fahrenheit scales, Thermal expansion, Gas Thermometers, Platinum resistance thermometer, Thermocouple.	JKD	5
	2nd	**2. Kinetic Theory of Gases:** Equation of state of an ideal gas, Equipartition of energy, Translational kinetic energy, Mean free path, Maxwell's theory of distribution of velocities, Brownian motion, Degrees of freedom & Molar Specific Heats, Van der Waals' Equation of state, Transport phenomena.	RI	5

	3rd	**3. Transmission of Heat:** Conduction, Convection, Radiation, Conduction of heat in solids, Measurement of thermal conductivity of a bad conductor, Heat conduction through composite walls.	RI	5
	4th	**4. First Law of Thermodynamics:** Internal Energy, Heat and work, Isothermal and adiabatic processes, Work done by expanding gases, Statement of first law of thermodynamics and applications.	JKD	5
2nd In-course (20 Lectures)	5th	**5. Second Law of Thermodynamics and Entropy:** The Thermodynamic temperature scale, Concept of entropy, Calculation of entropy change in reversible and irreversible processes, Entropy and second law of thermodynamics, Entropy and disorder. The Carnot engine, Efficiency of heat engines, Carnot's theorem, Refrigerator and air-conditioner, Clausius theorem, Clausius-Clapeyron equation.	JKD	6
	6th	**6. Third Law of Thermodynamics:** Nernst heat theorem, Phase rule and its uses, Third law of thermodynamics.	JKD	7
	7th	**7. Thermodynamic Functions:** Thermodynamic potentials at constant volume and pressure, Maxwell's thermodynamic relations, Specific heat equations, Joule-Thomson effect and its applications.	RI	7
Test (05 Lectures)	8th	**8. Radiation Laws:** Concept of black body and black body radiation, Emissive and absorptive powers, Kirchhoff's law, Stefan-Boltzmann's Law, Wien's displacement law, Rayleigh-Jean's law, Planck's quantum hypothesis, Planck's law, Applications of radiations laws.	JKD, RI	5
	1st to 8th	Revision		

Books Recommended:

1. এস.এম মো কছেদ আলী : তাপ ও তাপগতিবিদ্যা :
2. Halliday, D, Resnick, R. and : Fundamentals of Physics Walker, J.
3. Sears, F.W., Zemansky, M.W. : University Physics and Young, H.D.
4. Zemansky, M.W. : Heat and Thermodynamics
5. Sears, F.W. : An Introduction to Thermodynamics
6. Hossain, T. : Text Book of Heat
7. Saha, M.N. and Srivastava, B.N. : A Treatise on Heat.

Department of Physics
Rajshahi College, Rajshahi
Course Code: 212706
Course Name: Physics Practical-I
Marks: 100 Credits: 4

Course Code : **212706**   Assigned Course Teacher:
Course Title: **Physics Practical-I**   1Nripendra Nath Pal (NNP)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour   2. Joy Kumar Das (JKD)

To perform two experiments (one from each group) each of three hours duration.
i) Experiments (3 hours each)   2 x 40 = 80
ii) Laboratory note book   10
iii) Experimental Viva-voce   10
                                   Total marks = 100
  Marks for each experiment shall be distributed as follows:
a) Theory   05
b) Data collection and tabulation   15
c) Calculation, graphs and result   15
d) Discussion   05
                                   Total marks = 40

<u>**Group – A**</u> 1st In-course (25 Lectures)
1. Determination of acceleration due to gravity 'g' by compound pendulum.
2. Determination of acceleration due to gravity 'g' by Kater's pendulum.
3. Determination of Young's modulus and rigidity modulus by Searle's dynamic method.
4. Determination of rigidity modulus of a wire/rod by static method.
5. Determination of rigidity modulus of the material of a wire by dynamic method.
6. Determination of the spring constant and effective mass of a given spiral spring and hence to calculate the rigidity modulus of the material of the spring.
7. Determination of the Young's modulus by the flexture of a beam (bending method).
8. Determination of the moment of inertia of a fly-wheel about its axis of rotation.
9. Determination of the Young's modulus for the material of a wire by Searle's apparatus.
10. Determination of Surface tension of water by capillary tube method.
11. Determination of surface tension of mercury by Quincke's method.

<u>**Group – B**</u> 2nd In-course (25 Lectures)
1. Determination of the specific heat of solid by method of mixture, with radiation correction.
2. Determination of the specific heat of a liquid by the method of cooling.
3. Determination of the thermal conductivity of a good conductor by Searle's apparatus.
4. Determination of the thermal conductivity of a bad conductor by Lee's method.
5. Determination of mechanical equivalent of heat 'J' with radiation correction.
6. Investigation of the variation of resistance of a copper wire with temperature and determination of its temperature coefficient of resistance.
7. Verify the laws of transverse vibration of a stretched string with a sonometer (n-l, and n − 1/l curves only)
8. Determination of the frequency of a tuning fork by Melde's experiment.
9. Determination of latent heat of fusion of ice with radiation correction.
10. Determination of latent heat of condensation of steam with radiation correction.
11. Determination of density of water at various temperature by specific gravity bottle and study the variation of density with temperature from the graph.

Books Recommended:
1. Ahamed, G.U. and Uddin, M.S.   **:** Practical Physics
2. Chawdhury, S.A. and Bashak, A.K.   **:** ব্যবহারিক পদার্থবিদ্যা
3. Din, K. and Matin, M.A.   **:** Advanced Practical Physics
4. Worsnop and Flint   **:** Advanced Practical Physics

Department of Physics
Rajshahi College, Rajshahi

Course Code : 213709
Course Title: **Fundamentals Of Mathematics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1.Shaika Horkil (SH)
2.Mafruha Mustari (MM)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	<u>**Real Number System:**</u> Field and order properties, Natural numbers, Integers and rational numbers, Absolute value and their properties, Basic inequalities.	SH	5
	<u>**Complex Number System:**</u> Field of Complex numbers, De Moivre's theorem and its applications.	MM	3
	<u>**Theory of equations:**</u> Relations between roots and coefficients, Symmetric functions of roots, Sum of the powers of roots, Synthetic division, Descartes' rule of signs, Multiplicity of roots, Transformation of equations.	SH	6
	<u>**Two-dimensional Geometry:**</u> Transformation of coordinates, Pair of straight lines (Homogeneous second degree equations, General second degree equations represent a pair of straight lines, Angle between pair of straight lines, Bisectors of angle between pair of straight lines),	MM	6
	<u>**Two-dimensional Geometry:**</u> General equations of second degree (Reduction to standard forms, Identifications, Properties and Tracing of conics).	SH	5
2nd	<u>**Matrices and Determinants:**</u> Notion of matrix, Types of	MM	3

Examination	Course Content		Teachers	Lectures
Incourse (25 Lectures)	matrices, Algebra of matrices, Determinant and its properties, Minors, Cofactors, Expansion and evaluation of determinants, Elementary row and column operations and row-reduced echelon matrices, Invertible matrices, Diagonal, Triangular and Symmetric matrices.			
	System of Linear Equations: System of linear equations (Homogeneous and non-homogeneous) and their solutions, Gaussian elimination, Application of matrices and determinants for solving system of linear equations, Applications of system of equations in real life problems.		SH	5
	Vector Spaces: Euclidean n-space, Real vector spaces, Subspaces, Linear combination of vectors, Linear dependence of vectors, Basis and dimension, Linear transformations, Matrix representation of linear transformation, Kernel and image, Eigenvalues and Eigenvectors.		MM	5
	Three-dimensional Geometry: Three-dimensional coordinates, Distance, Direction cosines and direction ratios, Planes and straight lines,		SH	6
	Three-dimensional Geometry: Vectors in plane and space, Algebra of vectors, Scalar and vector product, Vector equations of straight lines and planes.		MM	6
Test (10 Lectures)	**Revision**			10

Books Recommended:
1. S. Bernard & J M Child : Higher algebra.
2. Howard Anton & Chris Rorres : Elementary Linear Algebra with Application.
3. Khosh Mohammad : Analytic Geometry and Vector Analysis.
4. Md. Abdur Rahman : Linear Algebra.
5. Md. Abdur Rahman : Higher Algebra.

Department of Physics
Rajshahi College, Rajshahi

Course Code : 213711   **Assigned Course Teacher:**
Course Title: **Calculus-I**   1Nadira Nazneen (NN)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Examination	Course Content	Teachers	Lectures
1st Incourse (12 Lectures)	**Functions & their graphs :** Polynomial and rational functions, Logarithmic and exponential functions, Trigonometric functions & their inverses, Hyperbolic functions & their inverses, Combinations of such functions.	NN	2
	Limit and continuity: Definitions and basic theorems on limit and continuity, Computation of limits.	NN	2
	Differentiation: Tangent lines and rates of change. Definition of derivative, One-sided derivatives. Rules of differentiation,	NN	4

	Successive differentiation, Leibnitz's theorem, Related rates, Linear approximations and differentials.		
	Integration: Anti-derivatives and indefinite integrals, Techniques of integration, Definite integration using anti-derivatives,	NN	4
2nd Incourse (12 Lectures)	**Applications of Differentiation:** Mean value theorem, Maximum and minimum values of functions, Concavity and points of inflection, Optimization problems.	NN	3
	Approximation and Series: Taylor polynomials and series, Convergence of series, Taylor's series, Taylor's theorem and remainders, Differentiation and integration of series.	NN	3
	Integration: Fundamental theorems of calculus, Basic properties of integration, Integration by reduction.	NN	3
	Applications of Integration: Arc length. Plane areas, Surfaces of revolution,	NN	3
Test (6 Lectures)	**Applications of Integration:** Volumes of solids of revolution, Volumes by cylindrical shells, Volumes by cross sections. **Revision**	NN	6

Books Recommended:
1. Howard Anton   : Calculus (7th and forward editions).
2. E.W. Swokowski   : Calculus with Analytic Geometry.
3. Md. A Matin & B Chakraborty   : Differential Calculus
4. Md Abu Yousuf   : Differential and Integral Calculus

Department of Physics
Rajshahi College, Rajshahi

Course Code : 212807
Course Title: **General Chemistry -I**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Jahsngir Ali (JA)
2 Shabnam Sultana (SS).

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Measurements and the Scientific Method:** Measurements, units, SI units, reliability of measurements – precision and accuracy, rounding off, significant figures, significant figures in calculation, mean and median, errors, sources of errors.	JA	4
	2. Structure of atom: Atom, isotopes, Atomic masses, Mass spectroscopy, Atomic nucleus, Nuclear binding energy, Nuclear reactions –fission and Fusion reactions, Bohr atom model, Spectrum of atomic hydrogen, Dual nature of electron, Heisenberg uncertainty principle, Quantum numbers, Atomic orbitals, Aufbau principle, Pauli exclusion principle, Hund's rule of maximum multiplicity, Electronic configuration of atoms	SS	7
	3. Periodic Table: Periodic law, Periodic table, Electronic configurations from the periodic table, Periodic properties of the elements such as ionization energies, Electron affinity, Electro negativity, Atomic/ionic radius along a period and down a group,	JA	5

	Diagonal relationship		
	4. Chemical Bonds: Chemical bond, Types of chemical bonds – ionic, Covalent coordination, Metallic, Hydrogen, Polar and no polar covalent bonds, Lewis dot structure, Shapes of molecules, VSEPR theory, Valence bond theory, Hybridization, σ- and π- bonding in compounds, Molecular orbital theory	SS	6
	5. Oxidation and reduction: Redox reactions, Writing and balancing Redox reactions	JA	3
2nd Incourse (25 Lectures)	**6. States of Matter:** Comparison between solids, Liquids and gases, Changes of state, m.p. and b.p, phase transition, Phase diagram of water.	SS	3
	7. Gaseous and Their Properties: The gas laws , The perfect gas equation, The kietic theory of gases, Van der waals equations, Real gases, Graham's laws of diffusion and Effusion.	JA	5
	8. Solutions: Solubility and intermolecular forces, Solubility product, Types of concentration units, Colligative properties of solutions, Henry's law, Nernst distribution law.	SS	5
	9. Acids and Bases: Various concepts on acids and bases, Conjugate acids and bases, Neutralization reactions acid- base strength, pH, Acid-base titrations, Acid-base indicatiors, Acid-base properties of salts, The common ion effect, Buffer solutions, Hard and soft acids and bases.	JA	7
	10. Chemical Equilibrium: Reversible reactions and the equilibrium state, The equilibrium law, Reaction quotients and equilibrium constants, Calculations using Kc, Kp, Homogeneous and heterogeneous equilibria, The principle of Le Chatelier and Brown.	SS	5
Test (10 Lectures)	**11. Hydrocarbons**: Hydrocarbons, Saturated and unsaturated hydrocarbons, Alkanes, Alkenes, And Alkynes, Nomenclature of organic compounds-the IUPAC system natural gas, Petroleum, Petrochemicals.	JA	3
	12. Study of different classes of organic Compounds: Alcohols, Aldehydes, Ketones, Carboxylic Acids, Esters, Amines and Amides.	SS	3
	Revision		4

Books recommended:
1. General Chemistry, D. D. Ebbing, Houghton Miffin Co.
2. Chemistry – The Molecular Nature of Matter and Change, M. Siberberg. WCB /Mc Graw- Hill.
3. Introduction to Modern Inogranic Chemistry, S.Z. haider, Friends' International.
4. Principles of physical chemistry, M. M. Huque and M. A Nawab, students' publications.
5. Essentials of Physical chemistry, B.S Bahl, G.D Tuli and A Bahl, S. Chand & Co.Ltd.
6. Advanced Organic Chemistry, B.S. Bahl and A Bahl, S. Chand & Co. Ltd.
7. A Level chemistry by C.W. Ramsden
8. Organic Chemistry: T Morrison and R.N Boyed,
9. Fundamental of Organic Chemistry by W Solomons

Department of Physics
Rajshahi College, Rajshahi
Course Code: 212808

Course Name: Chemistry-I Practical 30 Lectures

Marks: 50, Credits: 2

Course Code : **212706**   **Assigned Course Teacher:**
Course Title: **Physics Practical-I**   1Dr. Md Serajul Islam (SI)

Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour   2.Md. Abu Syeed (AS)

Exam	Content	Teachers	Lectures
1st In-course (12 Lectures)	1. Preparation of FeSO4 7H2O, Mohr's salt and potash alum. 2. Separation and identification of four radicals from a mixture of anions and cations The cations are pb2+, cu2+, Cd2+ , Al3+ , Fe2+ , Fe3+, Co2+, Ni2+, Zn2+ Ca2+, Ba2+, Na+, K+ , and NH4 + , the anions are NO3, CO3 2-, S2-, SO4 2-, Cl , Br and I+ 3. Standardization of NaOH solution using standard oxalic acid solution, 4. Determination of Fe2+ using standard permanganate solution 5. Iodometric determination of copper(II) using standard Na2SO3 solution. 6. Gravimetric determination of nickel as Ni(HDMG)2 complex	SI, AS	12
2nd In-course (12 Lectures)	7. Determination of the enthalpy change for the decomposition sodium dicarbonate into sodium carbonate. 8. Determination of the pH- neutralization curves of a strong acid by a strong base. 9. Investigation of the conductance behaviour of electrolytic solution and applications (acetic acid) 10. Determination of the presence of nitrogen, halogen and sulphur in organic compounds. 11. Identification of the functional groups (unsaturation, alcohol, phenol, carbonyl, aldehlyde, ketone, carboxylic acid, aromatic amine, amide and nitro- groups) in organic compound.	SI, AS	12
Test Lectures (6)	Revision		06

Books Recommended:

1. A Text Book of Quantitative Inorganic Analysis, A.I. Vogel, 3rd/4th edition, ELBS and Longman Green & Co. Ltd.

2. A Text Book of Quantitative Inorganic Analysis, A.I. Vogel 3rd/4th edition, ELBS and Longman Green & Co. Ltd.

3.   Practical physical chemistry, A Faraday.

4. A Text Book of practical organic chemistry, A.I. vogel, ELBS edition

Department of Physics
Rajshahi College, Rajshahi
Course Code: 213607
Course Name: **Introduction to Statistics**
Marks-100, (4 credits), 60 Lectures

Course Code : **212706**   **Assigned Course Teacher:**
Course Title: **Physics Practical-I**   1Prof. Dewan Abdur Razzak (DAR)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour
2. K.M. Mahfuzur Rahman (MR)

3. Md Syful Islam (SI)
4. Md. Rashidul Hoque (MRH)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Descriptive Statistics:** Statistics–Its nature and some important uses, Qualitative and quantitative data, Classification, Tabulation and frequency distribution, Graphical representation of data, Measures of location, Measures of Dispersion, Skewness and Kurtosis, Mathematical relationship among different measures of location, dispersion, Skewness and kurtosis.	DAR	9
	2. Bivariate Data: Correlation coefficient, Correlation analysis, The purpose and uses of regression analysis, Simple regression and methods of least squares and estimation of parameters, Correlation ratio, Rank correlation, Partial and multiple correlation.	MR	6
	3. Elementary Probability: Meaning of Probability, Classical and empirical definitions of Probability, Axiomatic approach of defining probability, Event, Sample space and simple problems on probability, Addition rule, Conditional probability, Multiplication rule and Bayes theorems, The concept of a random variables, Probability function and probability density function, Joint probability function. Marginal and conditional distributions, Statistical independence, Expected value and related theorems, Moment generating function, Common probability distributions, Binomial, Poisson and Normal.	SI	10
2nd Incourse (25 Lectures)	**4. Index Number:** Concept of an index number and problems in the construction of index number, Types of indices (Price, Quantity, Value and cost of living indices) and their uses, Tests for index numbers.	MRH	9
	5. Time Series analysis: Elements of time-series analysis, Measurement of trend by moving average, By least square method, Trend curve, Determination of seasonal indices, Cyclical movements.	MR	8
	6. Numerical Mathematics: Differences of a polynomial, Finite difference operator, Difference table, Newton's formula and starling's central difference formula, Inverse interpolation, Numerical integration.	SI	8
Test (10 Lectures)	**Revision**	MRH	10

Books Recommended:
1. Yule and Kendall **:** Introduction to Theory of Statistics.
2. Islam, M. Nurul. **:** An Introduction to Statistics and Probability.
3. Jalil A. and Ferdous R. **:** Basic Statistics.
4. Mostafa M.G. **:** Methods of Statistics.
5. David E.N. **:** Probability Theory for Statistical Methods.
6. Weatherburn C.F. **:** A First Course in Mathematical statistics.
7. Mosteller, Roure and Thomas **:** Probability with Statistical Applications.
8. Ali A. **:** Theory of Statistics Vol. I
9. Mallick, S.A. **:** সাংখ্যিক গণিত
10. Freeman H. **:** Acturial, Mathematics Vols; I and II
11. Scarborough **:** Numerical Mathematics.
12. David F.N. **:** Probability theory for Statistical Methods.

13. Shil R.N. **:** Introduction to Theory of Statistics.
14. Feller, W **:** Introduction to Statistical Time Series (latest ed.).
15. Gupta and Kapoor **:** Applied Statistics.

Department of Physics
Rajshahi College, Rajshahi
Course Code: 213608
Course Name: **Statistics Practical-I**
Marks-50, (2 credits), 30 Lectures

Condensation and tabulation of data, Graphical representation of data, Frequency table, Measures of location, Dispersion, Moments, Skewness and Kurtosis, measures of correlation coefficient, Rank correlation, Fitting of simple regression lines, Fitting of Binomial, Normal and Poisson's distributions, Finding trend values and seasonal variation from time series data by different methods, Calculation of Index numbers and test of index number, Use of Newton's forward and backward formula, Solution of numerical integration.

Department of Physics
Rajshahi College, Rajshahi

Course Code : **212706**
Course Title: **Physics Practical-I**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1 Nripendra Nath Pal (NNP)
2. Joy Kumar Das (JKD)

Examination	Course Content	Teachers	Lectures

1st Incourse (25 Lectures)	ভূমিকা: স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস-পরিধি ও পরিচিতি
	
	১। **দেশ ও জনগোষ্ঠির পরিচয়**
	   ক) ভূ প্রকৃতির বৈশিষ্ট্য ও প্রভাব
	   খ) নৃতাত্ত্বিক গঠন
	   গ) ভাষা
	   ঘ) সংস্কৃতির সমন্বয়বাদিতা ও ধর্মীয় সহনশীলতা
	   ঙ) অভিন্ন বাংলার পরিপ্রেক্ষিতে তৎকালীন পূর্ববঙ্গ ও বর্তমান বাংলাদেশের স্বকীয় সত্তা
			7

	২। **অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের প্রয়াস ও উপমহাদেশের বিভক্তি, ১৯৪৭**
	   ক) ঔপনিবেশিক শাসন আমলে সাম্প্রদায়িকতার উদ্ভব ও বিস্তার
	   খ) লাহোর প্রস্তাব, ১৯৪০
	   গ) অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের উদ্যোগ, ১৯৪৭ ও পরিণতি
			6

	ঘ) পাকিস্তান সৃষ্টি, ১৯৪৭		
	৩। পাকিস্তান: রাষ্ট্রীয় কাঠামো ও বৈষম্য		
	ক) কেন্দ্রীয় ও প্রাদেশিক কাঠামো		
	খ) সামরিক ও বেসামরিক আমলাতন্ত্রের প্রভাব		6
	গ) অর্থনৈতিক, সামাজিক ও সাংস্কৃতিক বৈষম্য		
	৪। ভাষা আন্দোলন ও বাঙালির আত্মপরিচয় প্রতিষ্ঠা		
	ক) মুসলিম লীগের শাসন ও গণতান্ত্রিক রাজনীতির সংগ্রাম		
	খ) আওয়ামী লীগের প্রতিষ্ঠা, ১৯৪৯		6
	গ) ভাষা আন্দোলন: পটভূমি ও ঘটনা প্রবাহ		
	ঘ) হক-ভাসানী-সোহরাওয়ার্দীর যুক্তফ্রন্ট, ১৯৫৪ সালের নির্বাচন ও পরিণতি		
2nd Incourse (25 Lectures)	৫। সামরিক শাসন: আইয়ুব খান ও ইয়াহিয়া খানের শাসনামল (১৯৫৮-৭১)		
	ক) সামরিক শাসনের সংজ্ঞা ও বৈশিষ্ট্য		
	খ) আইয়ুব খানের ক্ষমতা দখল ও শাসনের বৈশিষ্ট্য (রাজনৈতিক নিপীড়ন, মৌলিক গণতন্ত্র, ধর্মের রাজনৈতিক ব্যবহার)		5
	গ) আইয়ুব খানের পতন ও ইয়াহিয়া খানের শাসন, এক ইউনিট বিলুপ্তিকরণ, সার্বজনীন ভোটাধিকার, এলএফও (Legal Framework Order)		
	৬। জাতীয়তাবাদের বিকাশ ও স্বাধিকার আন্দোলন		
	ক) সাংস্কৃতিক আগ্রাসনের বিরুদ্ধে প্রতিরোধ ও বাঙালি সংস্কৃতির উজ্জীবন		
	খ) শেখ মুজিবুর রহমানের ৬-দফা আন্দোলন		5
	গ) ৬-দফা আন্দোলনের প্রতিক্রিয়া, গুরুত্ব ও তাৎপর্য		
	ঘ) আগরতলা মামলা, ১৯৬৮		
	৭। ১৯৬৯-এর গণঅভ্যুত্থান ও ১১-দফা আন্দোলন		
	ক) পটভূমি		
	খ) আন্দোলনের কর্মসূচী, গুরুত্ব ও পরিণতি		4
	৮। ১৯৭০ এর নির্বাচন, অসহযোগ আন্দোলন ও বঙ্গবন্ধুর স্বাধীনতা ঘোষণা		
	ক) নির্বাচনের ফলাফল এবং তা মেনে নিতে কেন্দ্রের অস্বীকৃতি		
	খ) অসহযোগ আন্দোলন, বঙ্গবন্ধুর ৭ই মার্চের ভাষণ, অপারেশন সার্চলাইট		4
	গ) বঙ্গবন্ধুর স্বাধীনতা ঘোষণা ও গ্রেফতার		
	৯। মুক্তিযুদ্ধ ১৯৭১		
	ক) গণহত্যা, নারী নির্যাতন, শরণার্থী		
	খ) বাংলাদেশ সরকার গঠন ও স্বাধীনতার ঘোষণাপত্র		
	গ) স্বতঃস্ফূর্ত প্রাথমিক প্রতিরোধ ও সংগঠিত প্রতিরোধ (মুক্তিফৌজ, মুক্তিবাহিনী, গেরিলা ও সম্মুখ যুদ্ধ)		
	ঘ) মুক্তিযুদ্ধে প্রচার মাধ্যম (স্বাধীন বাংলা বেতার কেন্দ্র, বিদেশী প্রচার মাধ্যম ও জনমত গঠন)		
	ঙ) ছাত্র, নারী ও সাধারণ মানুষের অবদান (গণযুদ্ধ)		
	চ) মুক্তিযুদ্ধে বৃহৎশক্তি সমূহের ভূমিকা		
	ছ) দখলদার বাহিনী, শান্তিকমিটি, আলবদর, আলশামস, রাজাকার বাহিনী, রাজনৈতিক দল ও দেশীয় অন্যান্য সহযোগীদের স্বাধীনতাবিরোধী কর্মকান্ড ও বুদ্ধিজীবী হত্যা		7
	জ) পাকিস্তানে বন্দি অবস্থায় বঙ্গবন্ধুর বিচার ও বিশ্বপ্রতিক্রিয়া		
	ঝ) প্রবাসী বাঙালি ও বিশ্বের বিভিন্ন দেশের নাগরিক সমাজের ভূমিকা		
	ঞ) মুক্তিযুদ্ধে ভারতের অবদান		
	ট) যৌথ বাহিনী গঠন ও বিজয়		
	ঠ) স্বাধীনতা সংগ্রামে বঙ্গবন্ধুর নেতৃত্ব		
Test (10 Lectures)	১০। বঙ্গবন্ধু শেখ মুজিবুর রহমানের শাসনকাল, ১৯৭২-১৯৭৫		
	ক) স্বদেশ প্রত্যাবর্তন		
	খ) সংবিধান প্রণয়ন		5
	গ) যুদ্ধ বিধ্বস্ত দেশ পুনর্গঠন		
	ঘ) সপরিবারে বঙ্গবন্ধু হত্যা ও আদর্শিক পটপরিবর্তন		
	Revision		5

Department of Physics
Rajshahi College, Rajshahi
English version

Course Code : **212706**
Course Title: **Physics Practical-I**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Nripendra Nath Pal (NNP)
2. Joy Kumar Das (JKD)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**Introduction:** Scope and description of the emergence of Independent Bangladesh. Writing on this topic. **Description of the country and its people.** a. Geographical features and their influence. b. Ethnic composition. c. Language. d. Cultural syncretism and religious tolerance. e. Distinctive identity of Bangladesh in the context of undivided Bangladesh.		7
	Proposal for undivided sovereign Bengal and the partition of the Sub Continent, 1947. a. Rise of communalism under the colonial rule, Lahore Resolution 1940. b. The proposal of Suhrawardi and Sarat Bose for undivided Bengal : consequences c. The creation of Pakistan 1947 .		6
	Pakistan: Structure of the state and disparity. a. Central and provincial structure. b. Influence of Military and Civil bureaucracy. C . Economic , social and cultural disparity		6
	Language Movement and quest for Bengali identity a. Misrule by Muslim League and Struggle for democratic politics . b. The Language Movement: context and phases . c. United front of Haque – Vasani – Suhrawardi: election of 1954, consequences.		6
2nd Incourse (25 Lectures)	**Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971)** a. Definition of military rules and its characteristics. b. Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation) c. Fall of Ayub Khan and Yahia Khan's rule (Abolition of one unit, universal suffrage, the Legal Framework Order)		5
	Rise of nationalism and the Movement for self determination . a. Resistance against cultura l aggression and resurgence of Bengali culture. b. Sheikh Mujibur Rahman and the six point movement		5

	c. Reactions : Importance and significance d . The Agortola Case 1968.	
	The mass- upsurge of 1969 and 11 point movement: background,programme and significance.	4
	Election of 1970 and the Declaration of Independence by Bangobondhu a. Election result and centres refusal to comply b. The non co-operation movement, the 7th March , Address , Operation Searchlight c. Declaration of Independence by Bangobondhu and his arrest	4
	The war of Liberation 1971 a. Genocide, repression of women, refugees b. Formation of Bangladesh government and proclamation of Independence c. The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas and the frontal warfare) d. Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion) e. Contribution of students, women and the masses (Peoples war) f. The role of super powers and the Muslim states in the Liberation war. g. The Anti-liberation activities of the occupation army, the Peace Committee, Al-Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators , killing of the intellectuals. h. Trial of Bangabondhu and reaction of the World Community. i. The contribution of India in the Liberation War j. Formation of joint command and the Victory k. The overall contribution of Bangabondhu in the Independence struggle.	7
Test (10 Lectures)	. **The Bangabondhu Regime 1972-1975** a. Homecoming b. Making of the constitution c. Reconstruction of the war ravaged country d. The murder of Bangabondhu and his family and the ideological turn-around.	5
	Revision	5

সহায়ক গ্রন্থ

১. নীহার রঞ্জন রায়, *বাঙালীর ইতিহাস*, দে' জ পাবলিশিং, কলকাতা ১৪০২ সাল।

২. সালাহ্ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস ১৯৪৭-১৯৭১*, আগামী প্রকাশনী, ঢাকা ২০০২।

৩. সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১*, ৩ খন্ড, এশিয়াটিক সোসাইটি অব বাংলাদেশ, ঢাকা ১৯৯২।

৪. ড. হারুন-অর-রশিদ, *বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিক উন্নয়ন ১৭৫৭-২০০০*, নিউ এজ পাবলিকেশন্স, ঢাকা ২০০১।

৫. ড. হারুন-অর-রশিদ, *বাঙালির রাষ্ট্রচিন্ত্র ও স্বাধীন বাংলাদেশের অভ্যুদয়*, আগামী প্রকাশনী, ঢাকা ২০০৩।

৬. ড. হারুন-অর-রশিদ, *বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।

৭. ড. আতফুল হাই শিবলী ও ড.মোঃ মাহবুবর রহমান, *বাংলাদেশের সাংবিধানিক ইতিহাস ১৭৭৩-১৯৭২*, সুবর্ণ প্রকাশন, ঢাকা ২০১৩।

৮. মুনতাসির মামুন ও জয়ন্ত কুমার রায়, *বাংলাদেশের সিভিল সমাজ প্রতিষ্ঠার সংগ্রাম*, অবসর, ঢাকা ২০০৬।

৯. আতিউর রহমান, *অসহযোগ আন্দোলনের দিনগুলি: মুক্তিযুদ্ধের প্রস্তুতি পর্ব*, সাহিত্য প্রকাশ, ঢাকা ১৯৯৮।

১০. ড. মোঃ মাহবুবর রহমান, *বাংলাদেশের ইতিহাস, ১৯০৫-৪৭*, তাম্রলিপি, ঢাকা ২০১১।

১১. ড. মোঃ মাহবুবর রহমান, *বাংলাদেশের ইতিহাস, ১৯৪৭-১৯৭১*, সময় প্রকাশন, ঢাকা ২০১২।

১২. সৈয়দ আনোয়ার হোসেন, *বাংলাদেশের স্বাধীনতা যুদ্ধে পরাশক্তির ভূমিকা*, ডানা প্রকাশনী, ঢাকা ১৯৮২।

১৩. আবুল মাল আবদুল মুহিত, *বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব*, সাহিত্য প্রকাশ, ঢাকা ২০০০।

১৪. শেখ মুজিবুর রহমান, *অসমাপ্ত আত্মজীবনী*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১২।

১৫. সিরাজ উদ্দীন আহমেদ, *একাত্তরের মুক্তিযুদ্ধ: স্বাধীন বাংলাদেশের অভ্যুদয়*, ইসলামিক ফাউন্ডেশন, ঢাকা ২০১১।

১৬. জয়ন্ত কুমার রায়, *বাংলাদেশের রাজনৈতিক ইতিহাস*, সুবর্ণ প্রকাশন, ঢাকা ২০১০।

১৭. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947,* The University Press Limited, Dhaka 2012.

১৮. Rounaq Jahan, *Pakistan: Failure in National Integration,* The University Press Limited, Dhaka 1977.

১৯. Talukder Maniruzzaman, *Radical Politics and the Emergence of Bangladesh,* Mowla, Brothers, Dhaka 2003.

২০. মেসবাহ কামাল ও ঈশানী চক্রবর্তী, *নাচোলের কৃষক বিদ্রোহ, সমকালীন রাজনীতি ও ইলা মিত্র*, উত্তরণ, ঢাকা ২০০৮।

২১. মেসবাহ কামাল, *আসাদ ও উনসত্তরের গণঅভ্যুথান*, বিবর্তন, ঢাকা ১৯৮৬।

COURSE PLAN
For
Honour's 2nd Year
Session: 2013-2014

Department of Physics

Rajshahi College,
Rajshahi

Contents

Department of Physics

Rajshahi College,

Rajshahi

2nd Year Honours

Paper Code	Paper Title	Marks	Credits
222701	Electricity & Magnetism	100	4
222703	Geometrical & Physical Optics	100	4
222705	Classical Mechanics	100	4
222706	Physics Practical-II	100	4
223707	Calculus-II	100	4
223708	Math Lab (Practical)	50	2
222807	General Chemistry-II	100	4
222809	Enviromental Chemistry	50	2
	Or		
223609	Methods of Statistics	100	4
223610	Statistics Practical-II	50	2
	Total=	700	28
221109	English (Compulsory)	100	Non-Credit

Department of Physics
Rajshahi College, Rajshahi

Course Code : 222701
Course Title: **Electricity & Magnetism**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Nripendra Nath Pal (NNP)
2. Md. Mahfuj Hasan
3. Rafiqul Islam (RI)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Electric Charge**: Electromagnetism, Electric Charge, Conductors and Insulators, Force due to two charges- Coulomb's law, Charge is Quantized, Charge is Conserved.	**NNP**	**3**
	2. Electric Field: The electric field strength, Lines of force, Electric field due to – a point charge, Electric dipole, charged disc, charged sheet, charged long wire, Electric dipole and quadrupole.	**NNP**	**3**
	3. Gauss' Law: Flux, Flux of an Electric Field, Gauss' law, Coulomb's law from Gauss' law in electric field. Application of Gauss' law for symmetrical objects.	**MH**	**3**
	4. Electric Potential: Electric potential and electric potential energy, Equipotential surfaces, Potential due to a point charge, a group of point charges and dipole. Calculation of field strength from potential, Insulated spherical conductor, Electrostatic generator, Electrical images.	**RI**	**4**
	5. Capacitor and Dielectrics: Use of capacitors, Capacitance, Capacitors in parallel & in series, Capacitance- its calculation for parallel-plate, cylindrical and spherical capacitors, Dielectric- an atomic view, Dielectric and Gauss's law, parallel plate capacitor with dielectric, electric vectors, Energy stored in an electric field.	**MH**	**4**
	6. Current and Resistance: Moving charges & electric current, Current and current density, Drift speed and charge carrier, Resistance, Resistivity and Conductivity, Ohm's law, Resistvity- an atomic view, Energy transfer in an electric circuit, Power in electric circuits, Semiconductors, Superconductors.	**RI**	**4**
	7. Electric Circuits: Work, Energy & electromotive force, Potential difference, Kirchhoff's laws, Current in single & multiloop circuits, Potentiometer, Wheatstone bridge, RC circuits, Ammeter &	**NNP**	**4**

Examination	Course Content	Teachers	Lectures
	Voltmeter, Multimeter & its uses.		
2nd Incourse (25 Lectures)	**8. Magnetic Field**: Magnetic induction, Magnetic force of a current, Torque on a current loop, Moving coil galvanometer, Ammeter, Voltmeter, Hall effect, Circulating charge, Thompson's experiment.	NNP	4
	9. Ampere's Law and Biot-Savart Law: Ampere's law and application such as calculation of magnetic induction near a long wire, inside a current carrying cylindrical wire, wire, inside a solenoid, two parallel conductors, Bio-Savart law and its application.	MH	4
	10. Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, Induction- a quantitative study, Self and mutual inductance and calculation of self inductance, LR circuit, Energy stored in a magnetic field, Magnetisaton, B-H curve.	RI	4
	11. Magnetism of Matter: Gauss' law for magnetic fields, Magnetism and electrons, Different magnetic material, induced magnetic field, Displacement current, Maxwell's equations.	RI	3
	12. Electromagnetic Oscillations: LC circuit, analogy to simple harmonic motion, LCR circuit, Q-Factor, Analogy to damped harmonic motion, Forced oscillations and resonance.	MH	3
	13. Alternating Current: Simple AC generator, Alternating voltage and current and their graphical representation, RMS value of current and voltage, Alternating voltage applied to resistors, capacitors and inductors. Alternating current and voltage in LR, LC and LCR circuits: series and parallel, Power dissipation in AC circuit, Power factor, AC measuring instruments, AC bridge.	MH	4
	14. Thermoelectricity: Seebeck, Peltier and Thomson effect, Relation between Seebeck, Peltier and Thomson's emf, Thermoelectric power, Thermocouple.	NNP	3
Test (10 Lectures)	Revision		

Books Recommended:
1. Halliday, D, Resnick, R. and Krane K.S. **:** Physics   2. Halliday, D, Resnick, R. and Walker, J. **:** Fundamentals of Physics   3. Tewari, K.K. **:** Electricity and Magnetism   4. Young, A.P. and Friemen **:** University Physics
5. Huq. M.S., Rafiqullah, A.K. & Roy, A.K **:** Concept of Electricity and Magnetism
6. Islam A.K.M.A, Islam M.N. and Islam, S **:** তড়িৎ চুম্বক তত্ত্ব ও আধুনিক পদার্থবিজ্ঞান

Department of Physics
Rajshahi College, Rajshahi

Course Code : 222703
Course Title: **Geometrical & Physical Optics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Alauddin (MA)
2. Md. Durul Hoda (DH)
3. Joy Kumar Das (JKD)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Geometrical Optics**: Spherical aberration, Chromatic aberration, Astigmatism, Ray matrices and its applications. Reflection and refraction, Total internal reflection, Polarization by reflection, Two types of images, Plane mirrors, Spherical mirrors, Images from spherical mirrors, Spherical refracting surfaces, Thin lenses, Power of lenses, Microscope, Telescope, Eye and its mechanism.	JKD	10
	2. Coherence: First order coherence, Spatial and Temporal coherence, Higher order coherence.	MA	6
	3. Interference of waves: Principle of superposition, Phase velocity and group velocity, Huygen's principle, Young's experiment,		9

Exam	Chapter	Content	Teachers	Lectures
		Fresnel biprism, Division of wavefront and amplitude, Michelson's interferometer, shapes and positions of fringes, Newton's ring and its experiment, Multiple beam fringes with a plane parallel plate, Fabry-Perot interferometer.	JKD	
1st Incourse (25 Lectures)		**4. Diffraction**: Diffraction, Fraunhofer and Fresnel diffraction, Single, double and multiple slit diffraction, Diffraction grating, spectrometer, Resolving power, Fraunhofer diffraction at a circular aperture, Fresnel half period zone, Fresnel diffraction at a straight edge.	DH	9
		5. Polarisation: Definition, Plane, Circular and Elliptical polarization, Malu's law, Brewster's law, Optical activity, Double refraction, Optic axis, half-wave and quarter-wave plate, Nicol prism, Polarimeter.	MA	8
		6. Dispersion and scattering: Dispersion, Cauchy and Selemeier formula, Scattering, Rayleigh scattering, Thomson's Scattering.	DH	8
Test (10 Lectures)		Revision		10

Books Recommended:
1. Eugene Hecht and Alfred Zajac **:** Optics
2. Rossi, B. **:** Optics
3. Guenther. R.D. **:** Modern Optics
4. Born, M, and Wolf **:** Principles of Optics
5. Brijlal **:** Optics

Rajshahi College, Rajshahi

Course Code : 222705
Course Title: **Classical Mechanics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1.Dr. Md. Abu Rejoan (MAR)
2. Tajemul Hoque (TH)
2. Joy Kumar Das (JKD)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	1. **Review of Elementary Principles**: Equations of motion, Conservation laws of a system of particles, Constraints, Generalised co-ordinates, Generalised force, D'Alembert's principle and Lagrange's equations.	MAR	8
	2nd	2. **Lagrangian Formulation**: Variational method, Euler-Lagrange equations of motion, Hamilton's principle, Lagrange's equation from Hamilton's principle, Applications of Lagrange's equation.	TH	8
	3rd	3. **Two-body Central Force Problem**: Two-body central force problem-reduction to equivalent one-body problem, Kepler's laws of planetary motion, Centre of mass and laboratory co-ordinates, Transformation of scattering problem from laboratory co-ordinates to centre of mass co-ordinates.	JKD	9
2nd In-course (25 Lectures)	4th	4. **Dynamics of Rigid Body Motion**: Kinematics and dynamics of rigid bodies, Independent co-ordinates, orthogonal transformation, Euler's angles, Euler's equation of motion for solving	MAR	6

Test (10 Lectures)	5th	5. **Hamiltonian Mechanics**: Legendre transformations and the Hamilton's equations of motion, Derivation of Hamilton's equations from variational principle, Principle of least action and its application.	TH	10
	6th	6. **Canonical Transformation**: Equations of canonical transformation, Legendre transformations, Integral invariant of Poincare, Lagrange and Poisson Brackets.	JKD	9
	7th	7. **Small Oscillations**: Formulation of the problem, Study of small oscillations using generalized co-ordinates, Normal co-ordinates, Normal modes, Forced vibrations.	MAR	10
		Revision		

Books Recommended:
1. Goldstein, H.   :   Classical Mechanics
2. Harun-ar-Rashid, A.M.   :   Classical Mechanics (in Bangla)
3. French, A.P.   :   Special Relativity

Department of Physics
Rajshahi College, Rajshahi

Course Code : 222706
Course Title: **Physics Practical-II**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Nripendra Nath Pal (NNP)
2. Md. Durul Hoda (DH)
3. Joy Kumar Das (JKD)

To perform two experiments (one from each group) each of three hours duration.

i)	Experiments (3 hours each)	2 x 40 =	80
ii)	Laboratory note book		10
iii)	Table Viva-voce		10
		Total marks=	100

Marks for each experiment shall be distributed as follows:
a)	Theory	5
b)	Data collection and tabulation	15
c)	Calculation, graphs and result	15
d)	Discussions	5
	Total marks =	40

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Class)	**(One Experiment of 3 hrs. duration to be performed)** 1 Determination of logarithmic decrement of a Ballistic galvanometer		**25**

	and C.D.R.
	2. Determination of self inductance of a coil by Rayliegh's method.
	3 Mutual inductance for varying distance between two coils.
	4 Determination of absolute capacitance of a condenser using a ballastic galvanometer.
	5 Determination of platinum resistance thermometer co-efficients.
	6 To investigate the voltage current relationship for a simple
	    inductive circuit and hence to determine the inductance.
	7 To investigate the voltage current relationship for an a.c.
	    capacitor circuit and hence to determine the capacitance.
	8 To study the variation of capacitive and inductive reactances with
	    frequency.
	9 Calibration curve of a thermocouple and determination of the melting point of wax.		

2nd Incourse
(15 Class)
	Group – B
	    (One experiment of 3 hrs. duration to be performed)
	1 Determination of wavelenght of light by Newton's rings.
	2 Determination of wavelenght using a bi-prism.
	3 Specific rotation of plane of Polarisation in sugar solution by polarimeter.
	4 Determination of refractive index of prism material by spectrometer.
	5 Determination of wavelenght of spectral lines from gas discharge
	    tube by diffraction grating.
	6 Calibration of a spectrometer and determination of a unknown wave length.
	7 Determination of Cauchy's constants.
	8 To determine the refractive index of the material of a prism
	    and a given liquid by total internal reflection using a spectrometer.
	9 To determine the thickness (or refractive index) of a very thin transparent plate.
			15

Test (5 Class)	**Revision**		**5**

Books Recommended:
1. Ahmed, G.U. and Uddin, M.S.   :   Practical Physics
2. Din, K. and Matin, M.A.   :   Advanced Practical Physics
৩. Chawdhury, S.A. and Bashak, A.K. :   ব্যবহারিক পদার্থবিদ্যা

Department of Physics
Rajshahi College, Rajshahi

Course Code : 223707
Course Title: **Calculus- II**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Sarwar Jahan (SJ)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Vector valued functions of a single variable:** Limits. Derivatives and integrals. Tangent lines to graphs of such functions. Arc length from vector viewpoint. Arc length parametrization .	SJ	8
	2.Curvature of space curves: Definition. Curves of zero curvature. Curves of constant non-zero curvature. Cartesian equations and parametric equations. Radius of curvature. Centre of curvature.	SJ	8
	3.Functions of several variables: Limits and continuity. Partial derivatives. Differentiability, linearization and differentials. The chain rule. Partial derivatives with constrained variables. Directional derivatives, gradient vectors and tangent planes. Extreme values and saddle points of functions of several variables. Lagrange multipliers. Taylor's formula.	SJ	9
2nd Incourse (25 Lectures)	**4.Multiple Integration:** Double integrals and iterated integrals. Double integrals over nonrectangular regions. Double integrals in polar coordinates. Area by double integrals. Triple integrals and iterated integrals. Volume as a triple integral. Triple integral in cylindrical and spherical coordinates. General multiple integrals. Jacobians.	SJ	13
	5.Topics in Vector Calculus: Scalar and vector fields, Gradient, divergence and curl, and their properties. Line integrals, Independence of paths. Green's theorem. Surface integrals. Stokes' theorem. The divergence theorem.	SJ	12
Test (10 Lectures)	**Revision**		10

Books Recommended :

1. Howard Anton-Calculus 5/E (and forward edition)

Department of Physics
Rajshahi College, Rajshahi

Course Code : 223708
Course Title: Math Lab (Practical)
Marks 50, 2 Credits, 30 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. NuruL Islam (NI)

Getting started. Problem solving using Mathematica /Maple (Problems will be selected from courses studied in the first and second years of their studies).

Students are required to work on their assignments in MMT 201 in the lab sessions.

Department of Physics
Rajshahi College, Rajshahi
Course Code: 222807
Course Name: **General Chemistry–II**
Marks-100, (4 credits), 60 Lectures

Course Code : 222807

Assigned Course Teacher:

Course Title: **General Chemistry–II**　　　　　1Md. Gias Uddin (GU)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour　　2. Md. Serajul Islam (SI)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	1. **Nonmetals:** General properties of nonmetals, ortho and para hydrogen molecules, allotropy of carbon, catenation, halogens and their basic properties, chemistry of noble gases.	GU	4
	2. **Metals:** Metallic bond, electron sea theory of metallic bond, characteristics of metals, band theory of conductivity, conductors, semiconductors and insulators, transition metals and inner transition metals colour and magnetism in transition metal chemistry.	SI	5
	3. **Energy changes in chemical Reactions:** System and surroundings, open system and closed system, thermodynamics, state functions, the first law of thermodynamics, the concept of internal energy and enthalpy, measurement of enthalpy changes, enthalpy of formation, Hess's law, lattice enthalpy, Born-Haber cycle, second law of thermodynamics, entropy and free energy.	GU	5
	4. **Rates of chemical Reactions:** Reaction rate, rate constant, rate law, order of reactions, first order reaction, half life, order and molecularity, effect of temperature on the rate of reaction, collision theory and reaction rates, activation energy, Arrhenius equation.	SI	4
	5. **Electrochemistry:** Redox reactions, electrolytic and galvanic cells, cell notation, standard reduction potentials, emf of cells, the effect of concentration of cell emf, batteries, corrosion.	GU	4
	6. **Catalysis:** Catalyst, homogeneous catalysis, enzyme catalysis, auto catalysis.	SI	3
2nd Incourse (25 Lectures)	7. **Solids:** Properties of solids, crystalline and amorphous solids, distinction between crystalline and amorphous solids, isomorphism, polymorphism and allotropy, crystal lattice unit cell crystal systems Bragg's law.	GU	5
	8. **Coordination Chemistry:** Coordination compounds, ligands, coordination number, nomenclature, structures of complex compounds, Werner's primary and secondary valency concept, sidwick's electronic concept, valence bond theory, stability of coordination compounds.	SI	5
	9. **Aromatic Compounds:** Aromaticity aromaticity of benzene, Electrophillic aromatic substitution reactions with reference to nitration halogention, sulphonation and alkylation. Heterocyclic compounds: Pyrrole, furan, thiophene, pyridine.	GU	5
	10. **Organic reactions:** Brief study on Electrophilic addition, Nucleophilic addition, Elimination reaction, condensation reaction, oxidation, and reduction reactions and organic compounds. Mechanism and application of the following reactions, Friedel Craft reaction, Clemmenson reduction, Wolf Krishner reduction, Perkin reaction, Claisen reaction, Cannizzaro reaction and Aldol condensation.	SI	6
	11. **Carbohydrates:** Definition, classification, structure and reactions of monosacchanides. Polysaccharide-cellulose and strach.	GU	4
Test (10 Lectures)	12. **Amino Acids:** Structures classification, synthesis physical and chemical properties of amino acids.	SI	3

13.	**Polymer Chemistry:** Polymers homopolymer, heteropolymer, low density and high density polymer, copolymers, studies of some polymers- polyvinylchloride, nylon 66, silk and wool.	GU	3
	Revision		4

Books Recommended:

1. General Chemistry , D.D. Ebbing Houghton Miffin Co.
2. Chemistry – The Moleceular Nature of Matter and Change, M. silberberg, WCB/ Mc Graw-Hill.
3. Introduction to Modern Inorganic Chemistry, S.Z. Haider, Friends International.
4. Selected Topics on Advanced Inorganic Chemistry, S. Z. Haider, Students' publication
5. Modern Inorganic Chemistry, R.D. Madan, S. Chand & company Ltd.
6. Selected Topics in Inorganic Chemistry, W.U. Malik, G. D. Tuli and R.D. Madan, S. Chand & Company Ltd.
7. Organic Chemistry by T Morison and RN bayed
8. Fundamental of organic Chemistry by salomans
9. Organic Chemistry Vot I& II IL fair
10. Basic Inorganic Chemistry, F.A. Cotton,G. Wilkinson, and P. L. Gaus, John willey & Sons.
11. Principles of physical chemistry, M. M. Huque and M. A. Nawab, students' publications.

Department of Physics
Rajshahi College, Rajshahi

Course Code : 222809
Course Title: Environmental Chemistry
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Serajul Islam (SI)
2.Md. Gias Uddin (GU)

Examination	Course Content	Teachers	Lectures
1st Incourse (12 Lectures)	1. Environment: Introduction components of environment, factors affecting environment, environmental management, environment and health, environmental chemistry, segments of environment – atmosphere hydrosphere, lithosphere and biosphere, structure of atmosphere.	SI	4
	2. Pollution and Pollutants: Pollution, environmental pollution, pollutant, classification of pollutants, types of pollution PCBS and their sources and hazards, Detection & estimation of PCBS. Biomultification.	GU	4
	3. Air Pollution: Introduction air quality, major sources of air pollution, gaseous pollutants, acid rain- how acid rain is formed, adverse effects of acid rain, greenhouse effect- how the greenhouse effect is produced, consequences of greenhouse effect and global warming EL Nino phenomenon and its effect, ozone depletion, mechanism of ozone depletion, effects of ozone depletion.	SI	4
2nd Incourse (12 Lectures)	4. Water Pollution: Introduction, classification of water pollutants, physical, chemical and biological characteristics of wastewater, industrial wastewater treatment, municipal water treatment, water quality parameters and standards, measurements of important parameters such as PH, DO, BOD, COD and temperature for water quality assessments.	GU	4
	5. Soil Pollution: Composition of soil, importance of soil to the biosphere, sources of soil pollution, effects of soil pollution- synthetic fertilizer and pesticides, effects of industrial effluents, effects of urban wastes, control of soil pollution.	SI	4
	6. Heavy metals in the Environment: trace metals, light metals and heavy metals, deadly heavy metals, sources of heavy metals, biochemical effects, toxicity, toxicology, control and treatment of mercury, chromium, arsenic and lead.	GU	4
Test (6 Lectures)	**Revision**	SI	6

Books Recommended:
1. Environmental Chemistry, B.K. Sharma, Goel Publishing House.
2. Environmental Chemistry, AK. De New Age International Publishers.
3. Environmental Chemistry, S.E. Manahan, CRC Press.
4. A Textbook of Environmental Chemistry and Pollution Control,
S.S. Bara S. Chand & Company Ltd.

Course Code : 223609
Course Title: Methods of Statistics
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Samira Begum (SB)
2.Md. Rashidul Hoque (RH)

Examination	Course Content	Teachers	Lectures
1st Incourse (25 Lectures)	**1. Sampling Distribution:** Concept of sampling distribution of Statistics and its standard error, , t and F statistics and their distributions, properties and uses of these distributions.	SB	8
	2. Design of Experiment: Principles of experimental design and analysis of variance, Meaning of experiments and randomization, Replication and local control, Basic designs: CRD, RBD and LSD, Analysis of these designs, Estimation of parameters, Missing plot estimation and analysis, Factorial experiment, 2^2, 2^3. factorial experiments, Analysis and interpretation of these designs.	RH	8
	3. Survey Methods: Concept of population, Sample, Sampling, Types of sampling, Principles of random sampling, Census and surveys, Advantages and limitations of sample survey over census, Sampling frame. Sampling and non-sampling errors, Detailed study of simple random sampling, Stratified random sampling, Systematic sampling and cluster sampling, Concept of quota sampling, Multistage sampling.	SB	9
2nd Incourse (25 Lectures)	**4. Test of Hypothesis:** Concept of test of hypothesis, Logic behind tests of hypothesis, Neyman Pearson's approach of testing hypothesis, Preliminaries of tests: Hypothesis, Null and alternative hypotheses, Simple and composite hypotheses, Concept of test of significance, Procedures of testing a hypothesis, Test errors, Level of significance, One-tailed and two-failed tests, P-value. Concept of test statistics: Normal, , t and F statistics.	RH	13
	5. Testing the significance of a single mean, Single variance, Single proportion, Difference of two means and two proportions, Ratio of two variances and their confidence intervals, Confidence intervals concerning simple correlation coefficient and regression coefficient for single and double sample, Paired t-test, Testing the homogeneity of several population means, Variance and proportions, Test of goodness of fit.	SB	12
Test (10 Lectures)	**Revision**		10

Books Recommended :

1. David F.N. : Probability theory for statistical Methods

2. Levy H, and Roth L : Elements of Probability

3. Mostafa M.G. : Methods of Statistics

4. Islam M.N. : Introduction to Statistics and probability.

5. Kapoor; Saxena : Mathematical Statistics

6. Ali A. : Theory of statistics Vol. I

7. Mood, Graybill and Boes : Introduction to the Theory of Statistics 3rd Ed.

8. Hogg,R.V.and Craig,A.T. : An introduction to Mathematical Statistics.

4. Federer : Experimental Design; Theory and Applications.

5. Mallick S.A. : Parikkaneer Design.

6. Bhuiyan M.R. : Fundamentals of Experimental Design.

7. Anderson, R.L. and Bancroft. T.A. : Statistical Theory in Research

8. Mood and Graybill : Introduction to the Theory of Statistics

9. Weather Burn C.E. : A First Course in Mathematical Statistics

10. Cochran G.W. : Sampling Techniques

Department of Physics
Rajshahi College, Rajshahi

Course Code : **223610**
Course Title: **Statistics Practical (Introduction to Statistics + Methods of Statistics)**
Marks 50, 2 Credits, 30 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Samira Begum (SB)
2.Md. Rashidul Hoque (RH)

1. Introduction to Statistics: Condensation and tabulation of data, Graphical representation of data, Frequency table, Measures of location, Dispersion, Moments, Skewness and Kurtosis, Measures of correlation coefficient, Rank correlation, Fitting of simple regression lines, Fitting of Binomial, Normal and Poisson distributions, Finding trend values and seasonal variation from time series data by different methods, Calculation of index numbers and test of index number, Use of Newton's forward and backward formula, Solution of numerical integration.

2. Methods of Statistics: Analysis of basic designs, Missing plot estimation and analysis of these designs, Measures of relative efficiency, Analysis of factorial designs, Drawing of SRS, Estimation of mean and properties with standard error in SRS, Drawing of stratified random samples and estimation of mean and variance of population from samples of stratified random samples, Cluster samples, Systematic samples and determination of relative efficiency.

3. Test of Hypothesis: Common tests of significance of Mean, Variance, Proportion, Correlation coefficient and Regression coefficient, Fitting of theoretical distributions and testing of goodness of fit, tests of large samples, Tests of homogeneity, Construction of confidence intervals.

Department of Physics
Rajshahi College, Rajshahi

Examination	Course Content	Teachers	Lectures

1st Incourse (25 Lectures)	Aims and objectives of this course: To develop students' English language skills, to enable them to benefit personally and professionally. The four skills − listening, speaking, reading and writing will be integrated to encourage better language use.
	1. Reading and understanding 5×4=20
	  Students will be expected to read passages that they might come across in their everyday life, such as newspapers, magazines, general books etc. Simple stories will also be included to give students a familiarity with different uses of the language.
	  [N.B. : 5 Questions are to be answered. Each question will carry 4 marks. There may be division in each question]
	  a) Understanding different purposes and types of readings
	  b) Guessing word-meaning in context.
	  c) Understanding long sentences
	  d) Recognizing main ideas and supporting ideas.
	  e) Answering comprehension questions.
	  f) Writing summaries.
			9

	2. Writing 40
	  a) Writing correct sentences, completing sentences and combining sentences. 5
	  b) Situational writing : Posters, notices, slogans, memos, advertisements etc. 4
	  c) Paragraph writing : Structure of a paragraph; topic sentences; developing ideas; writing a conclusion; types of paragraphs (narrative, descriptive, expository, persuasive); techniques of paragraph development (such as listing, cause and effect, comparison and contrast). 8
	
	Or,
	  d) Newspaper writing : Reports, press releases dialogues etc.
	  e) Writing resume©s. Or, 8
	  f) Writing letters : Formal and informal letters, letters to the editor, request letters, job applications, complaint letters etc.
	  g) Essay : Generating ideas; outlining; writing a thesis sentence; writing the essay: writing introductions, developing ideas, writing conclusions; revising and editing. 15
			8

	3. Grammar 25
	  a) Word order of sentences.
	  b) Framing questions.
	  c) Tenses, articles, subject-verb agreement, noun-pronoun
			8

	agreement, verbs, phrasal verbs, conditionals, prepositions and prepositional phrases, infinitives, participles, gerunds. (Knowledge of grammar will be tested through contextualised passages). d) Punctuation.		
2nd Incourse (25 Lectures)	4. Developing vocabulary : Using the dictionary, suffixes, prefixes, synonyms, antonyms, changing word forms (from verb to noun etc.) and using them in sentences. 10		8
	5. Translation from Bengali to English. 1×5=5		5
	6. Speaking skills : Speaking skills should be integrated with writing and reading in classroom activities. The English sound system; pronunciation skills; the IPA system; problem sounds, vowels, consonants and dipthongs; lexical and syntactic stress.		12
Test (10 Lectures)	(Writing dialogue and practising it orally students can develop their speaking skill. Dialogue writing can be an item in writing test.)		10
	Revision		

COURSE PLAN
For
Honour's 3rd Year
Session: 2013-2014

Department of Physics

Rajshahi College,
Rajshahi

Department of Physics
Rajshahi College,
Rajshahi

THIRD YEAR

Paper Code	Paper Title	Marks	Credits
232701	Atomic & Molecular Physics	100	4
232703	Quantum Mechanics-I	100	4
232705	Computer Fundamentals and Numerical Analysis	100	4
232707	Electronics-I	100	4
232709	Nuclear Physics-I	100	4
232711	Solid State Physics-I	100	4
232713	Mathematical Physics	100	4
232714	Physics Practical- III	100	4
	Total=	800	32

Department of Physics
Rajshahi College, Rajshahi

Course Code : **232701**
Course Title: **Atomic & Molecular Physics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1. Joy Kumar Das (JKD)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Quantum Theory**: Quantum character of radiation, Photoelectric effect, Einstein's photon theory, Photoelectric equation, Compton effect, Wave-particle duality, De Broglie wave, Electron diffraction: Thompson and Davisson-Germer experiment.	JKD	8
	2nd	**2. Rutherford Nucleus**: Rutherford alpha scattering experiment, Nucleus, Bohr quantization rules,	JKD	8

		Hydrogen atom spectra, Franck-Hertz experiment, Sommerfeld-Wilson quantization rules.		
	3rd	**3. Electron Spin**: Stern-Gerlach experiment, Pauli's exclusion principle, Electronic configuration of atom, Vector model, Coupling schemes, Hund's rule.	JKD	9
2nd In-course (25 Lectures)	4th	**4. Multiple Structure**: Fine structure, Hyperfine structure, Zeeman effect, Paschen-Back effect.	JKD	6
	5th	**5. X-rays**: Production and properties of X-rays, Continuous and characteristic X-rays, X-ray spectra: X-ray absorption: Moseley's law.	JKD	7
	6th	**6. Molecular Spectra**: Rotational and vibrational levels, Raman effect, Applications of Raman effect.	JKD	6
	7th	**7. Laser**: Stimulated emission, Einstein's A and B co-efficients, Population inversion, Laser idea, Three and four level lasers, Properties of a laser beam, Ruby, He-Ne and CO_2 lasers.	JKD	6
Test (10 Lectures)		**Revision**	JKD	10

Books Recommended:

1. Beiser, A.   :   Perspectives of Modern Physics
2. Beiser, A.   :   Concepts of Modern Physics
3. Svelto, O.   :   Principles of Laser
4. Weidner, R.T. and Sells R.L.   :   Elements of Modern Physics
5. Verdeyen, J.T.   :   Laser Electronics
6. Islam, G.S.   :   পারমাণবিক পদার্থবিজ্ঞান ১ম খন্ড

Department of Physics
Rajshahi College, Rajshahi

Course Code : **232703**   **Assigned Course Teacher:**
Course Title: **Classical Mechanics & Special Theory of**   1Dr. Md. Abu Rejoan (MAR)
Relativity

Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Review of Elementary Principles**: Equations of motion, Conservation laws of a system of particles, Constraints, Generalised co-ordinates, Generalised force, D'Alembert's principle and Lagrange's equations.	MAR	4
	2nd	**2. Lagrangian Formulation**: Variational method, Euler-Lagrange equations of motion, Hamilton's principle, Lagrange's equation from Hamilton's principle, Applications of Lagrange's equation.	MAR	5
	3rd	**3. Two-body Central Force Problem**: Two-body central force problem-reduction to equivalent one-body problem, Kepler's laws of planetary motion, Centre of mass and laboratory co-ordinates, Transformation of scattering problem from laboratory co-ordinates to centre of mass co-ordinates.	MAR	5
	4th	**4. Dynamics of Rigid Body Motion**: Kinematics and dynamics of rigid bodies, Independent co-ordinates, orthogonal transformation, Euler's angles, Euler's equation of motion for solving rigid body problems, symmetric top.	MAR	6
	5th	**5. Hamiltonian Mechanics**: Legendre transformations and the Hamilton's equations of motion, Derivation of Hamilton's equations from variational principle, Principle of least action and its application.	MAR	5
2nd In-course (25 Lectures)	6th	**6. Canonical Transformation**: Equations of canonical transformation, Legendre transformations, Integral invariant of Poincare, Lagrange and Poisson Brackets.	MAR	6
	7th	**7. Small Oscillations**: Formulation of the problem, Study of small oscillations using generalized co-ordinates, Normal co-ordinates, Normal modes, Forced vibrations.	MAR	6
	8th	**8. Special Theory of Relativity**: Michelson-Morley experiment, Galilean transformations, postulates of special theory of relativity, Lorentz transformation, Relativity of length or Lorentz-Fitzerald contraction, Time dilation.	MAR	7
	9th	**9. Relativistic Mechanics**: Mass and momentum four vector, Relativistic energy, Velocity addition, Mass-energy equivalence, Relativistic Mechanics and its Lagrangian Formulation.	MAR	6
Test (10 Lectures)		**Revision**	MAR	10

Books Recommended:
1. Goldstein, H.   :   Classical Mechanics
2. Harun-ar-Rashid, A.M.   :   Classical Mechanics (in Bangla)
3. French, A.P.   :   Special Relativity
4. Harun-ar-Rashid, A.M.   :   Einstein and Relativity Theory (in Bangla)

Course Code : **232703**   Assigned Course Teacher:
Course Title: **Quantum Mechanics-I**   1. Md. Alauddin (MA)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Physical Basis**: Failures of Classical Mechanics and emergence of Quantum Mechanics, Bohr atom model and old quantum theory, Quantization of the phase integral, Particle in a box, Shortcomings of old quantum theory, Wave particle duality, De-Broglie wavelength.	MA	8
	2nd	**2. Basic Concept of Quantum Mechanics**: Uncertainty principle, Postulates of quantum mechanics: (a) Interpretive postulates and (b) Physical postulates, Correspondence principle and complementary principle, Operators and its properties, Eigenfunctions and eigenvalues, Scalar product of two functions, Orthogonality relations of any function f(x), Heisenberg uncertainty relations for arbitrary observables, Momentum eigenfunctions, completeness.	MA	9
	3rd	**3. Schördinger Wave Equation**: Development of the wave equation, Interpretation of wave function, Probability current density, Expectation value of dynamical variables and Ehrenfest's theorem.	MA	8
2nd In-course (25 Lectures)	4th	**4. Principle of Superposition of States and Fourier Transforms of Wave Functions**: Co-ordinates and momentum representations, Wave packets and uncertainty principle, Monochromatic waves, Spread of Gaussian wave packets with time.	MA	8
	5th	**5. Problems in One-Dimension**: Particle in a box, Potential step, Potential barrier, Barrier Tunneling, Alpha particle decay, Square-well potentials, Linear harmonic oscillators.	MA	9
	6th	**6. Spherically Symmetric Systems**: Schrödinger Equation for spherically symmetric potentials, Spherical harmonics, Three-Dimensional square well potential, Hydrogen atom.	MA	8
Test (10 Lectures)		**Revision**	MA	10

Books Recommended:

1. Schiff, L.I.   :   Quantum Mechanics
2. Powell, J.L. and Crasemann, B.   :   Quantum Mechanics
3. Rashid, A.M.H   :   Quantum Mechanics
4. Merziacher, E.   :   Quantum Mechanics
5. Mathews, P.T.   :   Quantum Mechanics
6. Golder, S.K.   :   কোয়ান্টাম বলবিদ্যা
7. Bhuiya, G.M.   :   Quantum Mechanics
8. Sherwin, C.W.   :   Introduction to Quantum Mechanics

Department of Physics
Rajshahi College, Rajshahi
Course Code: 232705
Course Title: Computer Fundamentals and Numerical Analysis

Marks 100, 4 Credits, 60 Lectures

Course Code : **232705**
Course Title: **Computer Fundamentals and Numerical Analysis**

Assigned Course Teacher:
1.Md. Durul Hoda (DH)

Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1.Fundamental Concepts :** Block Structure of a Computer, Characteristics of Computers, Problem Solving with Computers, Generation of Computers, Classification of Computers.	DH	5
	2nd	**2.Logic Design:** Boolean Algebra; De-Morgan's Law, Minimum Boolean Expression; Karnaugh Map Method of Simplification of Logic Expression; Combinational and Sequential Circuits; Arithmetic Circuits. Fixed Point Representation – Integer Storage, Largest Integer Storage, Negative Integer Storage representation, Floating Point representation, Overflow and Underflow.	DH	5
	3rd	**3.Digital Devices:** Logic Gates and their Truth Tables, Canonical Forms, Combinational Logic Circuits, Minimization Technique, Arithmetic and Data Handling Logic Circuits. Decoders, Encoders, Multiplexers, Demultiplexers. Combinational Circuit Design, Flip Flops, Half-Adder, Full-Adder, Race around problems, Counters, Asynchronous Counters, Synchronous Counters and their Applications, Odd Sequence Counter Design, Register of different types and their Applications; Minimization of Sequential Circuits, and Memory Units.	DH	5
	4th	**4. Computer CPU:** CPU Organization, Function of ALU, CPU Instruction, Types of Buses, Size of CPU Registers –Program Counter, Memory Address Register, Memory Data Register, Accumulator. Input-Output Devices – Architecture of Keyboard, Mouse, Webcam, Scanner, Types of Monitor, Types of Printer	DH	5
	5th	**5.Input and Output Units :** Their Functional Characteristics, Types of Primary (Main) Memory, Types of Secondary Memory, Chache Memory, Physical and Virtual Memory, Types of Optical Memory, RAM Disks. Addressing Modes – Direct Addressing, Indirect Addressing, Indexed Addressing, Immediate Addressing Modes.	DH	5
2nd In-course (25 Lectures)	6th	**6. Computer Storage Devices:** Overview of Storage Devices- Floppy Disk, Hard Disk, Compact Disk, Tape. Secondary Storage Devices, Sequential and Direct Access Devices, Magnetic Disk, Floppy Disk, Winchester Disk, Mass Storage, Optical Disk, Magnetic Bubble Memory.	DH	10
	7th	**7.Software:** What is Software, Low level and High Level languages for programming, Relationship between Software and Hardware, Types of Software: System Software (Meaning and its type), Application Software, Acquiring Software, Software Development Steps, Firmware, Middleware.	DH	9

44

	8th	**9.Network:** Computer Communication, basic concepts of LAN, WAN, Workstation, and Server, Optical Fiber in Communication, World Wide Web (www) and E-mail, E-commerce.	DH	6
Test (10 Lectures)	10th	**10. Roots of Equations**: Bisection methods, False-Position method, Newton-Raphson method, Secant method, Systems of Linear Algebraic Equations, Naïve Gauss Elimination, Gauss-Jordan method and matrix inversion, Gauss-Seidel method, Nurnerical Integration: Trapezoidal rule, Simpson's rules, Ordinary Differential Equations. Runge-Kutta methods with different orders, Interpolation, Linear interpolation, Quadratic interpolation, Lagrange interpolating Polynomials.	DH	10
		Revision	DH	

Books Recommended:
1. Sarah E. Hutchinson and Stacey. Swyer **:**   Computers and Information Systemsl.
2. Byron Gottfried. **:**   Programming with C.
3. Stephen G. Kochan. **:**   Programming in C.
4. Herbert Schildt **:**   Turbo C/C ++ (The Complete Reference)
5. Hidebrand F.M. and Scarborough. **:**   :Numerical Analysis.
6. Floyd & Jain **:**   Digital fundamentals, Pearson Education.
7. Norton, P. **:**   Inside the PC.
8. Ram, B. **:**   Computer Fundamentals, Wiley, 1997.
9. French, C. S. **:**   Computer Science
10. Trainer, T. N. **:**   Computers (4th Edition) McGraw Hill, 1994.

Department of Physics
Rajshahi College, Rajshahi

Course Code : 232707   **Assigned Course Teacher:**
Course Title: **Electronics-I**   1Md. Mahfuj Hasan (MH)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. History of Electronics**: Electronics and electricity, Vacuum diode, Triode.	MH	3
	2nd	**2. Semiconductor Diode**: p-n junction, Forward and reverse bias, I-V curve, Diode equation, Ge and Si diodes, Breakdown PIV rating, DC and AC resistance, Load line and Q-point, Maximum current.	MH	5
	3rd	**3. Diode Applications**: Application in reverse voltage protection or auto polarity (using bridge) of dc equipment and as an OR gate in instant emergency power supplies, Half wave and full wave rectification of sinusoidal AC, Average voltage, Capacitor smoothing, Ripple factor and voltage, Zener voltage regulator.	MH	5
	4th	**4. Bipolar Junction Transistor (BJT)**: npn and pnp configurations, transistor action, CB, CE and CC configuration, alpha and beta parameters, CE characteristics, Load line and operating points, Cut-off and saturation, Transistor as a switch, Active region for liner amplification, Q-point, Graphical analysis, Class A, B and C amplifiers, Transistor biasing: Fixed bias, collector feedback and voltage divider bias, Emitter feedback for bias stabilization (including bypass capacitor), Ohm meter testing of transistor, Photo transistor characteristics.	MH	6
	5th	**5. Equivalent Models and Circuits**: Constant voltage and constant current sources, Thevenin's and Norton's theorems and determination of equivalent circuits for known and unknown network, Superposition theorem, Two-port network equations Z and h-equivalent circuits and parameters, Ebers Mol model and h-equivalent model for a transistor.	MH	6
2nd In-course (25 Lectures)	6th	**6. CE Amplifier**: Small signal analysis of a CE amplifier with voltage divider bias (voltage gain, input and output impedences) using Ebers Moll and approximate h-equivalent circuits, Typical CB and CC (Emitter Follower) amplifier circuits, Comparison of important features of CB, CE and CC amplifier, RC couple cascaded CE amplifier, Equivalent circuit and analysis.	MH	7
	7th	**7. Frequency Response of Amplifiers**: General voltage gain and phase response considerations, Bandwidth, Decibel (dB), Voltage gain, Identification of low pass and high pass elements in CE amplifier including stray capacitance and Miller effect capacitance and their responses.	MH	6
	8th	**8. Operational Amplifier**: Basic concepts on difference amplifier (double ended input, single ended output) as the input stage of an op-amp, Differential and Common mode operation, Common mode rejection ratio, Necessity of negative feedback, analysis for gain, input and output impedance for voltage series feedback, Frequency response, Gain-bandwidth product, Ideal op-amp approximations, Inverting amplifier, Non-inverting amplifier, Adder, Subtractor, Comparator, Applications in millivolt meter and current meter.	MH	7
	9th	**9. DC Stabilized Power Supply**: Series voltage regulation with feedback using transistor and op-amplifier, IC regulators (positive and negative, fixed and variable).	MH	5
Test (10 Lectures)		**Revision**		10

Books Recommended:

1. Brophy, J.J.   :   Basic Electronics for Scientists
2. Malvino, A.P.   :   Electronic Principles
3. Boylestad, R. and Nashelsky   :   Electronic Devices and Circuit Theory
4. Millman, J. and Halkias, C.C.   :   Electronic Devices and Circuits
5. G.M. Chowdhury   :   ইলেক্ট্রনিক্স

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Department of Physics
Rajshahi College, Rajshahi

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Course Code : 232709   **Assigned Course Teacher:**
Course Title: **Nuclear Physics-I**   1Md. Rafiqul Islam (RI)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Basis Properties of Nuclei**: Constituents of nuclei, Nuclear mass, charge, size; Nuclear density, Mass defect, Binding energy, Nucleon separation energy, Liquid drop mode, Semi empirical mass formula.	RI RI	3
	2nd	**2. Nuclear Spin**: Nuclear spin and angular moment, Nuclear moments, magnetic dipole moment, Effective magnetic moment expression, Electric moments (Multipole expression).	RI	5
	3rd	**3. Radioactivity**: Radioactive decay laws, Half life, Mean life, Transformation law of successive changes, Secular and transient equilibrium, Measurement of decay constant, Artificial radioactivity, Radioisotopes; production and uses, Units of radioactivity, Energy loss of charged particles, Collision energy loss, Radiation energy loss, straggling of alpha particles range in the absorber. **Radiation hazards,** Biological effects of radiation, interaction of radiation with human cells.	RI	6
	4th	**4. Alpha Decay**: Alpha instability, Fine structure, Large range alpha particles, Alpha particle spectra and nuclear energy levels, Theory of alpha decay.	RI	5
	5th	**5. Beta Decay**: Energy measurement, Conservation of energy and momentum, Neutrino hypothesis, Evidence for antineutrino, orbital electron capture, Positron emission.	RI	6
2nd In-course (25 Lectures)	6th	**6. Gamma Decay**: Energy measurement, Pair spectrometer, Theory of gamma emission, Mean lives for gamma emission, Internal conversion, Mossbauer effect.	RI	7
	7th	**7. Nuclear Fission and Fusion**: Fission process, Energy release in fission, Chain reaction, Nuclear reactor, Nuclear fusion, Thermonuclear reaction is stars.	RI	6
	8th	**8. Detectors**: Ionization chambers, Proportional counter Geiger-Muller counters, Solid State Detector, Scintillation counter.	RI	7
	9th	**9. Nuclear Reactions**: Reaction dynamics, The Q-Value equation and threshold energy Conserved Properties.	RI	5
Test (10 Lectures)		**Revision**		10

Books Recommended:

1. Enge, H.A.   :   Introduction to Nuclear Physics

2.	Cohen, B.L.	: Concepts of Nuclear Physics
3.	Meyerhoff, W.E.	: Elements of Nuclear Physics
4.	Burcham, W.E	: Nuclear Physics
5.	Irving Kaplan	: Nuclear Physics
6.	Gelly, A.H .	: Fundamentals of Nuclear Physics
7.	Krane, K.S.	: Introductory Nuclear Physics
8.	Islam, A.K.M.A. and Islam, M.A.,	: নিউক্লীয় পদার্থবিজ্ঞান ২য় সংস্করণ
9.	Islam, G.S.	: পারমাণবিক পদার্থবিজ্ঞান ২য় খন্ড
10.	Sen Gupta	: নিউক্লীয়ার পদার্থবিদ্যা
11.	Knolls	: Principle of Radioactive protection.

Department of Physics
Rajshahi College, Rajshahi

Course Code : 232711
Course Title: **Solid State Physics-I**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Tajemul Hoque (TH)
2. Joy Kumar Das (JKD)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Crystal Structure**: Crystalline state of solids, Unit cells and Bravais lattices, Symmetry operations, Miller indices, Crystal planes and directions, Simple crystal structures, Diffraction of X-rays by crystals, Laue equations and Bragg law of x-ray diffraction, Experimental diffraction methods – Laue method, Rotating crystal method and Powder method, Reciprocal lattice.	TH	8
	2nd	**2. Crystal Bonding**: Interatomic forces and crystal bonding, Ionic crystals – Calculation of electrostatic energy, Madelung constant, Repulsive interactions and bulk modulus, Covalent crystals, Crystals of inert gases – Van der waals, Metal crystals and Hydrogen bonded crystals.	TH	9
	3rd	**3. Lattice Vibrations and Thermal Properties**: Vibrations of monatomic linear lattice, Vibrations of diatomic linear lattice, Phonon, Phonon momentum, Enumeration of normal modes, Lattice specific heat, Einstein and Debye models, Lattice thermal resistivity, Normal and Umklapp processes.	TH	8
2nd In-course (25 Lectures)	4th	**4. Defects in solids**: Point defects, Thermodynamic consideration of defect concentration – Schottky and Frankel types of defects, Colour centers in ionic crystals, Line defects, Various types of dislocations.	TH	6
	5th	**5. Free Electron Theory of Metals**: Free electron gas, Energy levels, Degenerate and Non-degenerate states, Fermi-energy absolute zero temperature, Density of state, Fermi-function, Effect of temperature on Fermi energy, Average kinetic energy. Electronic specific heat, Electrical conductivity, Thermal conductivity, Hall effect of free electron, Wiedmann-Franz law.	TH	10
	6th	**6. Fundamentals of Semiconductors:** The electrical properties of solids, Energy levels in crystalline solid, Insulators, Conductors, Semiconductors, Doped semiconductors, n-type semiconductors, p-type semiconductors, pn-junction, Majority and minority carriers, Junction rectifier, Diode, Light-Emitting Diode (LED), Transistor, Integrated Circuit (IC).	TH	9
Test (10 Lectures)		**Revision**	TH	10

Books Recommended:
1. Kittel, C.   :   Introduction to Solid State Physics
2. Dekker, A.J.   :   Solid State Physics

3. Omar, A.M.   :   Elementary Solid State Physics
4. Singhal, R.L.   :   Introduction to Solid State Physics
5. Saxena, Gupta and Sexena   :   Fundamentals of Solid State Physics
6. Islam, M.S.   :   কঠিন অবস্থার পদার্থবিজ্ঞান
7. সাইদুজ্জামান   :   সলিড স্টেট ফিজিক্স

Department of Physics
Rajshahi College, Rajshahi

Course Code : 232713   **Assigned Course Teacher:**
Course Title: **Mathematical Physics**   1. Joy Kumar Das (JKD)

Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Functions of complex Variable**: i) Complex algebra, Cauchy-Riemann equations as conditions of analyticity, Cauchy's integra theorem for analytic function. ii) Taylor series expansion, Types of singularities, Laurent expansion, Cauchy's Residue Theorem, Contour integration using the residue technique. iii) Gamma function and Beta functions, their recursion properties and singularities.	JKD	12
	2nd	**2. Fourier Series and Integral Transformations**: a) Fourier's theorem about periodic functions. Determination of Fourier coefficients. Gibbs phenomenon. Parseval relation. Summation of series using Fourier method. b) Fourier transformation via Fourier series. Inverse Fourier transformation. Idea of a function Space and the fourier transforms as its dual space. Properties of Fourier transformations. Parseval relation. Dirac delta function. Fourier sine and cosine transformation. Use of Fourier transformations for solving differential equations. Convolution theorem.	JKD	13
2nd In-course (25 Lectures)	3rd	**3. Transformations:** Laplace transform. Inverse Laplace transformation: Bromwich integral. Elements of operational calculus.	JKD	8
	4th	**4. Special Functions in Physics**: Gamma and Beta functions. Series solution of differential equations by Forbenius method. Bessel Functions. Legendre. Hermite and Laguerre Polynomials-generating functions, recursion relation and orthogonality properties.	JKD	9
	5th	**5. Theory of Matrices**: Type of matrices (unitary, hermitian. Symmetric etc.); Determinant of a square matrix; Equivalence; Adjoint and inverse of a square matrix; Liner equations; Linear transformations: Similarity transformations.	JKD	8
Test (10 Lectures)		**Revision**	JKD	10

Books Recommended:
1. Arfken, G.B.   :   Mathematical methods in Physics, (4th ed.)
2. Mary, L. Boas   :   Mathematical Methods in Physical Science
3. Pipe, L.A.   :   Applied Mathematics for Physicists and Engineers.

Department of Physics
Rajshahi College, Rajshahi

Course Code : 232714
Course Title: **Physics Practical-III**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Dr. Md. Abu Rejoan (MAR)
2.Md. Tajemul Hoque (TH)

To perform two experiments each of three hours duration.

i)	Experiments (3 hours each)	2 x 40= 80
ii)	Laboratory note book	10
iii)	Viva-voce	10
	Total marks	= 100

Marks for each experiment shall be distributed as follows:
a)	Theory	5
b)	Data collection and tabulation	15
c)	Calculation, graphs and result	15
d)	Discussions	5
	Total marks =	40

1. Formalization of an oscilloscope
   i) Stabilization of a signal display using triggering mechanism.
   ii) Measurement of tune period and amplifier.
2. Determination of Rydbegr constant using spectrometer.
3. Determination of dispersive power and resolving power of a prism.
4. Determination of dispersive power and resolving power of grating.
5. To determine the separation between D1 and D2 lines of sodium by Michelson interferometer.
6. To determine the refractive index (or thickness) of a film by Michelson interferometer.
7. To determine wavelength of monochromatic light by Michelson interferometer.
8. Determination of resonance frequency in LCR circuit with (a) L and C in series and (b) L and C in parallel.
9. Plotting the characteristic curve for a semi-conductor diode.
10. Plotting the characteristic curves of a transistor.
11. To construct a power supply and to find the ripple factor of full wave rectifier for two different loads.
12. Construction of an audio frequency amplifier employing transistors and study its frequency response.
13. To study the frequency response of a low pass RC filter.
14. Determination of Planck's constant.
15. Study of voltage divider bias for a CE amplifier.

Books Recommended:

1.	Worsnop B.L. and Flint, H.T.	:	Advanced Practical Physics
2.	Ahmed, G.U. and Uddin, M.S.	:	Practical Physics
3.	Ahmad, G. and Nasreen, F.	:	Advanced Practical Physics
4.	Din, K. and Matin, M.A.	:	Advanced Practical Physics
5.	Ahmed, R.	:	Experiments in Basic Electronics
6.	চৌধুরী, এস.এ	:	ব্যবহারিক পদার্থবিদ্যা

COURSE PLAN
For
Honour's 4th Year
Session: 2014-2015

Department of Physics

Rajshahi College,
Rajshahi

FOURTH YEAR

Department of Physics

Rajshahi College,

Rajshahi

FOURTH YEAR

Paper Code	Paper Title	Marks	Credits
242701	Nuclear Physics-II	100	4
242703	Solid State Physics-II	100	4
242705	Quantum Mechanics-II	100	4
242707	Electronics-II	100	4
242709	Classical Electrodynamics	100	4
242711	Statistical Mechanics	100	4
242713	Computer Application and Programming	100	4
242715	Theory of Relativity and Cosmology	100	4
242716	Physics Practical-IV	100	4
242718	Viva-Voce	100	4
	Total=	1000	40

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242701**
Course Title: **Nuclear Physics -II**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Rafiqul Islam (RI)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Two-Nucleon System: The Deuteron.** Central Potentials, Ground state of the Deuteron, Normalisation of the Deuteron Wave Function, Non-existence of Excited States, Tensor force, Magnetic and quardrupole Moments of the Deuteron.	RI	7
	2nd	**2. Two-Nucleon System: Scattering.** N-P and P-P Scattering at Low and High Energies, Scattering Length and Effective Range Theory, Coherent Scattering of Thermal Neutrons.	RI	6
	3rd	**3. Nuclear Forces**: Non-exchange and Exchange Forces, Meson Theory of Nuclear Force, One-Boson Exchange (OBE) potential, Paris Potential.	RI	6
	4th	**4. Nuclear Shell Model**: Shell-Model, Single Particle Potentials, Wave Function and Energy Levels, Magic Numbers, Prediction of Spin and Magnetic Moments, Schmidt Values and Lines.	RI	6
2nd In-course (25 Lectures)	5th	**5. Collective Model**: Rotational energy spectrum and nuclear wave function for even-even nuclei and for odd A nuclei, Beta and Gamma Vibrations in Nuclei.	RI	6
	6th	**6. Nuclear Reactions**: Compound Nuclear Model, Nuclear Cross-section, Brit-Wigner Resonance Formula, Direct reaction, Butler's Theory.	RI	10
	7th	**7. Optical Model:** Optical potential energy, Averaged Cross section, Optical Model at Low energy, Phenomenological Optical Model.	RI	9
Test (10 Lectures)	8th	**8. Accelerators**: Van de Graff Generator, Linear accelerator, Cyclotron, Synchrotron.	RI	4
	9th	**9. Elementary Particles**: General Properties and classification of elementary particles, Quantum numbers, different types of interaction and conservation laws; Cosmic rays (introduction).	RI	6
	1st to 9th	**Revision**	RI	

Books Recommended:
1. Krane, K.S.   :   Introductory Nuclear Physics
2. Enge, H.A.   :   Introduction to Nuclear Physics

3. Cohen, B.L.   :   Concepts of Nuclear Physics
4. Meyerhof, W.E.   :   Elements of Nuclear Physics
5. Satchler G.R.   :   Nuclear Reactions
6. Roy and Nigam   :   Nuclear Physics
7. Blatt and Weiskoff   :   Nuclear Physics
8. Segre, E.   :   Nuclear and Particles (2nd Ed)
9. Islam, A.K.M.A and Islam, M.A   :   নিউক্লীয় পদার্থবিজ্ঞান, ২য় সংস্করণ
10. Sen Gupta, H.M.   :   নিউক্লীয়ার পদার্থবিদ্যা
11. Islam, G.S.   :   পারমাণবিক পদার্থবিজ্ঞান ২য় খন্ড

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242703**   **Assigned Course Teacher:**
Course Title: **Solid State Physics -II**   1Md. Tajemul Hoque (TH)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Band Theory of Solids**: Formation of energy levels in crystals. Electron in a periodic potential, SchrÖdinger equation, Bloch function, Korning-Penny model, Properties of free electrons in a Brillouin zone, Concept of hole, Reduced zone scheme, Classification of metal, insulator and semi conductor, Band structure calculation, LCAO method and its application in simple cubic (sc), body centered cubic (bcc) and face centered cubic (fcc) lattice.	TH	8
	2nd	**2. Fermi Surfaces and Metals**: Reduced zone scheme, Periodic zone scheme, Construction of Fermi surfaces, Nearly free electrons, Electron orbits, Hole orbits and open orbits, Calculation of energy bands, Tight binding method for energy bands, Winger-Seitz method. Experimental methods in Fermi surface studies, Quantization of orbits in a magnetic field. De Haas-Van Alphen effect, Fermi surface of copper.	TH	8
	3rd	**3. Dielectric Properties**: Macroscopic electric field, Local electric field at an atom, Static dielectric constant, Electronic, Ionic and Orientational polarizibilities, Clausius-Mossotti relations, Complex dielectric constant, Dielectric loss, Relaxation time, Polarization mechanism, Pyro, Piezo and Ferro-electricity, dielectric properties in an alternating field, Properties of ferroelectric materials, Pole theory of ferro-electricity, Spontaneous polarization, Ferroelectric domain piezo-electricity, Electromechanical transducers.	TH	9
2nd In-course (25 Lectures)	4th	**3. Semiconductors**: Direct and Indirect band gap semiconductors, Extrinsic semiconductor, Shallow levels, Density of states, Charge carrier concentration, Carrier life time, Recombination process, P-N Junction, Depletion region, Junction capacitance, Diode current, Tunnel diode, Metal-semiconductor junction, Surface states.	TH	15

Exam	Chapter	Content	Teachers	Lectures
	5th	**5. Superconductivity**: Basic properties of superconductors, Meissner effect, Type-I and Type-II superconductors; Thermodynamics of superconductivity, London equation, BCS theory of superconductivity, Tunneling, D.C and A.C Josephson effect, High-Temperature superconductors.	TH	10
Test (10 Lectures)	6th	**6. Magnetism**: Origin of Magnetism, Diamagnetism, Paramagnetic equations Ferromagnetism, Weiss theory of ferromagnetism, Nature and origin of Weiss molecular field, Concept of domains and Hysteresis, Anti-ferromagnetism, Ferrimagnetism, Magnons.	TH	10
	1st to 6th	**Revision**	TH	

Books Recommended:

1. Dekker, A.J. : Solid State Physics
2. Kittel, C. : Introduction to Solid State Physics
3. McKelvey : Solid State and Semiconductor Physics
4. Brailsford, F. : Physical Principles of Magnetism
5. Chikazumi, S. : Physics of Magnetism
6. Singhal, R.L. : Introduction to Solid State Physics
7. Islam M.S. : কঠিন অবস্থার পদার্থ বিজ্ঞান
8. সাইদুজ্জামান : সলিড স্টেট ফিজিক্স
৯. . এস. এম. মোকছেদ আলী : কঠিন অবস্থার পদার্থ বিজ্ঞান

Department of Physics
Rajshahi College, Rajshahi

Assigned Course Teacher:
1Md. Alauddin (MA)

Course Code : **242705**
Course Title: **Quantum Mechanics -II**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Operators and Matrices**: Linear operators, Kets and Bras, Eigenvalues and eigenkets, Expansion in eigenkets, Completeness and orthogonality of eigenkets, Representation of an operator, Commuting operators, Projection, Hermitian operator, Unitary operators, Diagonalization of a matrix.		8
	2nd	**2. Matrix Formulation of Quantum Mechanics**: Linear vector space, Hilbert space, Matrix representation of state vectors and Operators, Transformation theory, Schordinger, Heisenberg and Dirac pictures, Parity operator, Density matrix, Harmonic oscillator		8
	3rd	**3. Theory of Angular Momentum**: Definition of angular momentum, Angular momentum operators and their commutation relations, Eigenvalues of angular momentum, Addition of angular momenta, Clebsch-Gordon coefficients, Explicit forms of the angular		9

Exam	Chapter		Content	Teachers	Lectures
	4th	4.	**Approximation Methods**: WKB-Approximation method, Stationary perturbation theory, Time-dependent perturbation theory, Variational method.		6
2nd In-course (25 Lectures)	5th	5.	**Theory of Scattering**: Two body systems, Scattering cross-section, Scattering of particles by spherically symmetric potentials, Partial waves, Phase shifts, General formulation of scattering theory, Born approximation method and its application.		10
	6th	6.	**Identical Particles**: Symmetric and antisymmetric wave functions, Exclusion Principle, Spin and statistics, Projection and density operators, Liouville's equation of motion, Polarization vector for a spin S-particle, Scattering of identical particles.		9
Test (10 Lectures)	7th	7.	**Relativistic Wave Equations**: Klein-Gordon equation, Dirac's relativistic equation, Covariant form of Dirac's equation, Dirac's equation for a central field, Spin angular momentum of the particle, Magnetic moment of the Dirac's particle, Negative energy states and hole theory.		10
	1st to 7th	**Revision**			

Books Recommended:
1. Schiff, L.I. : Quantum Mechanics
2. Powell, J.L. and Crasemann, B. : Quantum Mechanics
3. Rashid, A.M.H. : Quantum Mechanics
4. Merzbacher, E. : Quantum Mechanics
5. Landau, L.D. and Lifshitz, E.M : Quantum Mechanics
6. Dirac, P.A.M : The Principles of Quantum Mechanics
7. Rose, M.E : Elementary Theory of Angular Momentum
8. Edmonds, A.R. : Angular Momentum in Quantum Mechanics
9. Newton, R.G. : Scattering Theory of Waves and Particles
10. Golder, S.K. : কোয়ান্টাম বলবিদ্যা

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242707**
Course Title: **Electronics –II**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Md. Mahfuj Hasan (MH)

Exam	Chapter		Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	1.	**Power Amplifiers**: Class-B push-pull power amplifiers, Output power, Efficiency, Transistor power dissipation, Transformer coupled and complementary push-pull circuits, Crossover distortion and eliminate-ion, Basic concepts of harmonic distortion.		7
	2nd	2.	**Oscillator Circuits**: Positive feedback and Barkhausen		6

56

		criterion for oscillation, Wien-bridge, Hartley and Colpitts oscillator, BJT stable multivibrator.		
	3rd	3. **Field Effect Transistors**: JFET action, Depletion and enhancement MOSFET, Advantages over bipolar transistors.		6
	4th	4. **SCR and TRIAC**: SCR action and characteristics, Switching and half wave phase control of power, TRIAC action and characteristics, Full wave phase control.		6
2nd In-course (25 Lectures)	5th	5. **Electronic Devices for Measurement**: Basic concepts of thermistors, Photoconductive cells, Liquid crystal displays, Seven-segment displays, Cathode ray table.		6
	6th	6. **Digital Electronics, An Overview**: Analogue and digital world, Advantages in error free communication and processing, Binary representation of digital values by electronic circuit elements, Number systems and codes: Decimal, Binary and hexadecimal numbers, conversion, Binary addition, Codes: BCD, ASCII.		7
	7th	7. **Digital Logic Circuits**: Logic gates, definitions, symbols and truth tables, Boolean expression, simple logic circuit example, Diode gate, DTL gate, TTL gate, Truth table and Boolean algebra, half adder circuit, SR flip flop, Binary counter.		6
	8th	8. **Radio Principles**: Basic concepts of modulation and demodulation, AM transmitter and TRF receive circuits, super heterodyne receivers.		6
Test (10 Lectures)	9th	9. **IC Fabrication Technique**: Monolithic planar process, Fabrication schemes for resistance, diode and transistor on a silicon chip.		4
	10th	10. **Television**: Basic principle, Image scanning and display, Block diagram of a B/W receiver, LCD and LED television.		3
	11th	11. **Radar**: Basic principles, Block diagram, Radar range equation.		3

Books Recommended:
1. Boylestad, R. and Nashelsky, L.   **:** Elctronic Devices and Circuit Theory.
2. Brophy, J.J.   **:** Basic Electronics for Scientists
3. Millman, J. and Halkias, C.C   **:** Electronic Devices and Circuits
4. Malvino, A.P   **:** Electronic Principles.

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242709**
Course Title: **Classical Electrodynamics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1Nripendra Nath Pal (NNP)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Electrostatics** a) **Electric Field**: Gauss laws in integral and differential form. b) **Scalar Potential**: Lap lace's equation and Poisson's equation, Boundary conditions and uniqueness theorem, General solution of the Poisson's equation, The method of images to solve electrostatic problems, Boundary value problems in rectangular, spherical and polar coordinates, Multipole expansion. c) **Electrostatics in Dielectric**: Field inside a dielectric, Boundary condition on **E** and **D**		10
	2nd	**2. Elements of Magnetostatives**: a) Concept of a vector potential and the differential equation for it, Magnetostatic boundary condition problems, Multipole expansion for the vector potential: Magnetic field due to a localized current distribution, Magnetic dipole moment. b) Magnetization-boundary conditions on **B** and **H**.		6
	3rd	**3. Maxwell's Equations**: a) Equation of continuity. Maxwell's displacement current, Maxwell's equations, Absence of isolated magnetic charges, Maxwell's equation in material media. b) Scalar and vector potentials in Maxwell's equation, Gauge transformation: Coulomb gauge and Lorentz gauge. c) Poynting vector and energy momentum conservation in electrodynamics: Energy density and Maxwell's stress tensor.		9
2nd In-course (25 Lectures)	4th	**4. Electromagnetic Wave Equation**: a) Wave equation for the electric and magnetic field from Maxwell's equation, Electromagnetic plane waves in vacuum and non-conducting media, Polarization of electromagnetic waves. b) Reflection and refraction of electromagnetic plane waves on a dielectric interface, Fresnel equations, Total internal reflection and polarization by reflection. c) EM waves in conductors: Attenuation, Skin depth, Reflection and transmission at a interface between a conductor and a dielectric.		15
	5th	**5. Wave Guides**: Solution of the wave equation in a rectangular wave guide, Transverse electric (TE) and transverse magnetic (TM) modes, Transverse electromagnetic (TEM) modes, Simple cavity resonator.		10

Exam	Chapter	Content	Teachers	Lectures
Test (10 Lectures)	6th	**6. Electromagnetic**: a) Solution of the wave equation in spherical coordinates, Multipole expansions, Retarded potentials, Electric dipole radiation, Short, Center-fed antenna. b) Radiation from a moving charge, Lienard-Wiechert potentials, Power radiated by a point charge, Radiation reaction-Abraham-Lorenz force.		10

Books Recommended:

1. Griffiths, D.J.   :Introduction to Electrodynamics
2. Panofsky, W. and Philips, M.   :   Classical Electricity and Magnetism
3. Jackson, J.D.   :   Classical Electrodynamics
4. Islam, A.K.M.A. and Islam, S.   :   তড়িৎ গতিবিজ্ঞান
5. Reitz, Millford.   :Classical Electrodynamics
৬. এস. এম. মোকছেদ আলী   :   তড়িত গতিবিদ্যা

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242711**
Course Title: **Statistical Mechanics**
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
1. Joy Kumar Das (JKD)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. The scope of statistical physics**: Assembles, Phase space, Liouville theorem. Distribution over energies, weights of configuration, the most probable configuration, The Maxwell-Botlzmann Distribution, Application.		8
	2nd	**2. Temperature and Entropy:** The statistical concept of temperature. Ensembles: Microcanonical, canonical and grand-canonical ensembles. Boltzmann formula. Entropy, Free energy and other thermodynamic functions.		8
	3rd	**3. The Thermodynamics of Gases:** The weight A_{max} for a classical perfect gas. The Boltzmann partition function, The evaluation of the classical partition function, The semi-classical perfect gas components of the partition function.		9
2nd In-course (25 Lectures)	4th	**4. Particle Statistics:** Principle of indistinguishability for quantum particles. Spin-statistics connection. Degenerate and non-degenerate system.		6
	5th	**5. Bose-Einstein Distribution:** Bose-Einstein gas, Black-body Radiation, The Photon gas, The Specific heats of solids, The Phonon gas, Bose-Einstein condensation, Fremi-Dirac Gas, The Electron Gas, Fermi degeneracy pressure.		10

Exam	Chapter	Content	Teachers	Lectures
	6th	**6. Applications of statistical thermodynamics:** The paramagnetic gas, the harmonic oscillator, the diatomic molecule, The disordered lattice		9
Test (10 Lectures)	7th	**7. Transport phenomena:** Boltzmann transport equation, H-theorem, validity of the equation, Mean free path, Viscosity and Diffusion, Electrical conductivity, Brownian motion.		6
	8th	**8. Phase Transition:** Thermodynamic classification of phase transitions, Difference between first and second order phase transition, Mean-field theory.		4

Books Recommended:
1. Reif, F : Fundamentals of Statistical Mechanics and Thermal Physics
2. Huang, K : Statistical Mechanics
3. Kittel, C : Elementary Statistical Mechanics
4. Beiser, A : Perspective of Modern Physics

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242713**   Assigned Course Teacher:
Course Title: **Computer Application and Programming**   Md. Durul Hoda (DH)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Introduction:** Object oriented development themes, Modeling Concepts, Modeling as a design technique, Object modeling, Dynamic modeling, Functional modeling.		8
	2nd	**2. Design Methodology:** Analysis, System design, Object design, Comparison of methodologies.		8
	3rd	**3. Network:** Computer Communication, basic concepts of LAN, WAN, Workstation, and Server, Optical Fiber in Communication, World Wide Web (www) and E-mail, E-commerce.		9
2nd In-course (25 Lectures)	5th	**4. Object Oriented Language:** C++ as an object oriented programming, Comparison of C and C++, Declaration and constants, Expression and statements, Data types, Operator, Functions, Inheritance – Extending classes, Encapsulation, Operator overloading and type conversion, Managing console I/O operation, Working with files, Object oriented system development.		8
	6th	**5. Object oriented Programming and Java:** Objects and classes, Attributes and behavior, Inheritance, Interfaces, and Packages, Creating a Class hierarchy,		9

		Statements and expressions, Variables and data types, Literals, Expressions and operators, Arrays and loops.		
	7th	**6. Creating Classes and Methods:** Defining classes, Class variables, Creating methods, Class methods, Constructor methods, Overriding methods, Finalizer methods.		8
Test (10 Lectures)	8th	**7. Developing Applets:** Applet and application, Creating applet, Including applet on web page, Java archives, Parameter to applet.		10
	9th	**Revision**		

Books Recommended:

1. Schildt, Herbert   :   Turbo C/C++, The Complete Reference
2. Gotfried, Byron   :   Programming with C++
3. Balagurusamy, E   :   Object Oriented Programming with C++
4. Brown, D   :   An Introduction to Object Oriented Analysis
5. Norton, Peter   :   Introduction to Computers
6. Deitel, H.M. and Deitel P.J.   :   JAVA How to Program.
7. Davis, Stephen R.   :   Teach Yourself JAVA in 21 days.

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242715**
Course Title: Theory of Relativity and Cosmology
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour

Assigned Course Teacher:
Dr. Abu Rejoan AR)

Exam	Chapter	Content	Teachers	Lectures
1st In-course (25 Lectures)	1st	**1. Introduction** Galilean transformation and invariance of Newton's laws of motion, non-invariance of Maxwell's equations. Michelson-Morley experiment and explanation of the null result.		7
	2nd	**2. Special Theory of Relativity** Concept of inertial frame. Postulates of special theory; simultaneity; Lorentz transformation along one of the axes – length contraction, time dilatation and velocity addition theorem, Fizeau's experiment. Four vectors. Relativistic dynamics : variation of mass with velocity; energy momentum relationship.		6
	3rd	**3. Relativistic Electrodynamics:** Magnetism as a relativistic phenomenon, Fields transformation, Field tensor, Electrodynamics in tensor rotation, Relativistic potential		6
	4th	**4. Vectors and Tensors** Covariant and contravariant vectors. Contraction. Covariant, contravariant, and mixed tensors of rank-2, transformation properties. The metric tensor (flat space-time only). Raising and lowering of indices with metric tensors.		6

2nd In-course (25 Lectures)	5th	**5. Invariant intervals** Concept of space-time: Euclidean and Minkowski. Invariant intervals in 1+1 and 3+1 dimensions (use Minkowski space-time). Space like, time-like and light like four vectors. Light cone. Causality and simultaneity in different frames.		6
	6th	**6. Tensor calculus:** Idea of Euclidean and non-Euclidean space, meaning of parallel transport and covariant derivatives, Geodesics and autoparallel curves, Curvature tensor and its properties, Bianchi Identities, vanishing of Riemann-Christoffel tensor as the necessary and sufficient condition of flatness, Ricci tensor, Einstein tensor.		10
	7th	**7. Einstein's field equations** Inconsistencies of Newtonian gravitation with STR, Principles of equivalence, Principle of general covariance, Metric tensors and Newtonian Gravitational potential, Logical steps leading to Einstein's field equations of gravitation.		9
Test (10 Lectures)	8th	**8. Cosmology:** Qualitative discussions on: White Dwarfs, Neutron stars and Black Holes, Static Black Holes (Schwarzschild and Reissner-Nordstrom). Rotating Black Holes, Cosmological Principles, Weyl postulates, Robertson-Walker metric (derivation is not required), Cosmological parameters, Static Universe, Expanding universe, Open and Closed universe, Cosmological red shift, Hubble's law. Olber's Paradox.		10
	9th	**Revision**		

Books Recommended:

1. Goldstein, H.   Classical Mechanics

2. Harun-ar-Rashid, A.M   Classical Mechanics

3. French, A.P.   Special Relativity

4. Harun-ar-Rashid, A.M.   Einstein and Relativity Theory (in Bangla)

5. S. Weinberg   Gravitation and Cosmology: Principles and Applications of the General

   Theory of Relativity (Wiley, 1972).

6. P. G. Bergmann   Introduction to Theory of Relativity (Pren tice-Hall, 1969

7. R. Resnick   Introduction to Special Theory of Relativity.

8. W.G.V.Rosser   Introduction to the Theory of Relativity.

Department of Physics
Rajshahi College, Rajshahi

Course Code : **242716**   **Assigned Course Teacher:**
Course Title: **Physics Practical -IV**   1MD. Mahfuj Hasan (MH)
Marks 100, 4 Credits, 60 Lectures, Class Duration : 1 Hour   2. Joy Kumar Das (JKD)

Examination duration: 6 hours.
                          To perform two experiments from group A, and one experiment each from group B and C.
All experiments should be of three hours duration.

i)	Experiments (3 hours each)	4 x 20	=	80
ii)	Laboratory note book			10
iii)	Viva-voce			10
	Total marks		=	100

Marks for each experiment shall be distributed as follows:

a)	Theory	3
b)	Data collection and tabulation	8
c)	Calculation, graphs and result	6
d)	Discussions	3
	Total marks =	20

Group – A: Electronics
1. To calibrate the frequency dial of a signal generator with the help of line frequency by forming Lissajous figures on an oscilloscope screen.
2. To determine the characteristics of a given transistor for common base and common emitter configurations and find the parameters α and β
3. To construct a free running multivibrator and measure its frequency from the display of its output wave forms on an oscilloscope screen.
4. To study a non-investing amplifier employing an operation amplifier (frequency response and gain).
5. To construct a saw tooth wave generator employing an unijunction transistor (2N2646) and determine its repetitive frequency.
6. To construct the AND OR and NOT (inverter) gates using semiconductor diodes and transistor.
7. To construct NOR and NAND gates.

Group – B: Nuclear Physics
1. (a) To determine the plateau and operating voltage of a Geiger-Muller counter.
    (b) To determine the dead-time of the G-M tube.
2. To find out the linear absorption coefficient, mass absorption coefficient and atomic absorption coefficient of lead. (Ra-Source or Cs-Source).
3. To determine the absorption co-efficient for beta radiation of a given material and find the range of beta radiation in that material (Y-Sr source).
4. To verify the inverse square law for γ–rays (Cs or Co-Source).

Group – C: Solid State Physics
1. To find out the speed of sound with the help of acoustic transducers.
2. To study the variation of impedance of a given acoustic transducer as a function of frequency.
3. To find out the forbidden energy gap of a given semiconductor specimen
4. To measure the dielectric loss of certain lossy materials.

Books Recommended:
1. Ahmad G. and Nasreen F : Advanced Practical Physics
2. Din K. and Matin M.A. : A text book of practical Physics
3. Squires G.L. : Practical Physics
4. Topping J. : Errors of observation and their treatment
5. Millman, J. and Halkias, C.C : Electronic Devices and Circuit
6. Mannan, K.M. and Pramanik, N : ব্যবহারিক পদার্থবিজ্ঞান ১ম ও ২য় খন্ড
7. Worsnop & Flint : Practical Physics

For
Masters
Session: 2011-2012

Department of Physics

Rajshahi College,

Rajshahi

National University
Syllabus for M.Sc. Final Course
Subject: Physics
Session: 2005-2006

Duration of Course : 1 Academic year

Groups : Two groups : Group-A(General group) and Group - B (Thesis group)

Total Marks of the Course : 600 (Theory : 400 + Practical/ Thesis : 100 + Viva-voce: 100)

Course Description

Type of Course	Subject Code	Subject Title	Unit	Marks
Compulsory	2751	Nuclear Physics	1.0	100
	2752	Solid State Physics	1.0	100
Optional (any two papers)	2753	Electronics	1.0	100
	2754	Health Physics	1.0	100
	2755	Reactor Physics	1.0	100
	2756	Medical Physics	1.0	100
	2757	Material Science	1.0	100
	2780	Practical (Group-A)	1.0	100
		OR		
	2770	Thesis (75 marks on thesis and 25 marks for viva-voce on thesis) (Group-B)	0.75	75
	2775	Viva-Voce (thesis)	0.25	25
	2790	Viva-Voce	1.0	100
		Total	**6.0**	**600**

Detailed Syllabus

Examination duration : 4 hours

(*Five* questions to be answered out of *Eight*)

1. **Fermi Gas Model :** Assumptions, Fermi momentum and Fermi energy, Calculation of average and maximum kinetic energies of a nucleon in a nucleus.

2. **Shell Model :** Single particle potentials, Spin-orbit potential, Magic numbers, Shell model predictions, Ground state spins, Spin and Magic moments of nuclei, Schmidt curves.

3. **Collective Model :** Rotational energy spectrum and nuclear wave function for even-even nuclei and for odd- even nuclei, Vibrational model, Beta and Gamma vibrations in nuclei.

4. **Nuclear Reactions :**

   (a) **Compound Nucleus Model :** Cross section by the method of partial waves, Compound nuclear reactions, Continuous theory, Resonance Breit-wigner dispersion formula for L=O.

   (b) **Optional Model :** Concept of optical potential, Energy averaged cross section and the optical model at low energies. Phenomenological optical model.

   (c) **Direct Reactions :** Direct reaction mechanism of nuclear reactions. Stripping pick up and knockout reactions. Plane wave theory of stripping and pick up reactions. Introduction to distorted wave method. Introduction to heavy ion reactions.

5. **Gamma Emission :** Gamma decay energetics. Multipole moments, Multipole fields, Theory of gamma emission, Selection rules. Angular correlations, Transition rates, Internal conversion, Measurement of Gamma ray energies and life time of excited states.

6. **Elementary Particles :** Definition. Classification: Bosons and Fermions: Leptons and Hadrons. Quantum number. Different types of interactions and conservation laws. Idea of quarks. Symmetry transformation, Unitary symmetry. Gauge symmetry. SU(2) XU(1) model (Salam Weinberg model).

10

Books Recommended :

1.	Enge, H. A.	: Introduction to Nuclear Physics
2.	Cohen , B. L.	: Concepts of Nuclear Physics
3.	W.E., Meyerhof	: Elements of Nuclear Physics
4.	Satchler, G. R.	: Nuclear Reactions
5.	Roy and Nigam	: Nuclear Physics
6.	Blatt and Weiskoff	: Nuclear Physics
7.	Preston and Bhaduri	: Structure of the Nucleus
8.	Feshbach. H.	: Theoretical Nuclear Physics; Nuclear Reactions
9.	Hodgson, P.E.	: Nuclear Reaction and Nuclear Structure
10.	Segre, E. and Benjammlnc, W. A.	: Nuclear and Particles (2nd Ed)
11.	Pierre Mermier and Eric Salauddin	: Physics of Nuclei and Particles
12.	Williams, W.S.C.	: Nuclear and Particle Physics
13.	Harun ur Rashid. A. M.	: Elementary Particles
14.	Islam, A. K. M. A and Islam. M. A.	: নিউক্লীয় পদার্থবিজ্ঞান, ২য় সংস্করণ
16.	Sen Gupta. H. M.	. : নিউক্লীয়ার পদার্থবিদ্যা

Subject Code – 2752 : Solid State Physics   1.0 Unit (100 Marks)
Examination duration : 4 hours
(*Five* questions to be answered out of *Eight*)

1. **Electron States and Energy Bands in Solids :** The nearly free electron model. The tight binding method, Cellular method, Muffin-Tin potentials. Pseudo potentials.

2. **The Fermi Surface :** High magnetic fields. High-field magneto-resistance. Open orbits, magneto-coustic oscillation. Quantization of orbits. The De-Haas-Van Alphen effect. Magnetic breakthrough.

11

68

Subject Code – 2754 : Health Physics   **1.0 Unit (100 Marks)**
Examination duration : 4 hours

(*Five* questions to be answered out of *Eight*)

1. **Radiation Detectors** : Scintillation detector, Semiconductor detectors, Tract etch detectors, TLD, Neutron detection.

2. **Radiation Dosimetry** : Radiation units. RBE, QF absorbed dose. Exposure dose relationship, Bragg- Gray principle, Internally deposited radioisotope, Calculation of dose rate from point and distributed sources.

3. **Problems in Radiation Detection and Measurements** : Detector efficiency. Energy selective counting, Absorption and scatter, Source and detection system calibration, Minimum detectable activity. Estimated required counting time. Application of different statistical distributions.

4. **Biological Effects of Radiation** : Chemical changes, Changes of biologically important molecules. Acute, Delayed and Genetic effects.

5. **Radiation Protection Guide** : Principle of radiation protection. Basic radiation safety criteria. Exposure of individuals in the general public. Allowable limit on intake. Typical rules for operation of a radiation laboratory.

6. **External Radiation Protection** : Techniques of external radiation protection. Shielding primary protective and secondary protection barriers, Charged particle and neutron shielding.

7. **Internal Radiation Protection** : Internal radiation hazard: Principle of control. Control of source. Environmental monitoring and control. Protective clothing. Respiratory protection. Surface. Contamination limits.

Books Recommended :

1. Cember. H.   :   Introduction to Health Physics
2. Martin and Halison   :   Introduction to Radiation protection

14

3.	Knoll, G.F	:	Radiation Detection and measurements
4.	Price, W.J	:	Nuclear Radiation Detection
5.	Turner, H	:	Principle of Radiation and Protection
6.	Bleubeur and Goldsmith	:	Experimental Nucleonics
7.	Dyson, N.A	:	Introduction to Nuclear Physics with Application in Medicine and Biology

Subject Code-2755 : Reactor Physics   1.0 Unit (100 Marks)
Examination duration : 4 hours

(Five questions to be answered out of *Eight)*

1. **Nuclear Reaction** : Neutron cross-section and its determination, Energy dependence of neutron cross sections, Fission cross-section.

2. **Diffusion and Slowing down of Neutrons** : Thermal neutron diffusion and diffusion equations. Fast neutron diffusion and Fermi age equations. Energy distribution and cross-section of thermal neutrons. Slowing down of neutrons. Critical equation and reaction bucking.

3. **Reactor Theory** : The steady state. Four factor formula. Neutron leakage and critical size. Calculation of K for homogeneous reactors, Classification of reactors. Research reactors, Swimming pool. Water boiler, Power and Breeder reactors, Heterogeneous reactors, Calculation of K for heterogeneous reactors.

4. **Control of Nuclear Reactors** : Reactor kinematics, General features of reactor control. Effect of temperature on reactivity. Design of the control system and reactor operation. Fission product poisoning. Burnable poisons.

5. **Energy Removal** : Thermal problems in reactor design. Design of cooling system. Heat sources in reactor systems. Reactor coolants and their characteristics.

6. **Reactor Fuels** : The fuel cycle. Production of reactor fuels. Sources of uranium, Separation of uranium isotopes, Re-processing of

Ultrasound Imaging : Nature, production and detection of ultrasounds; A-scan, B-scan, M-scan, Clinical applications.

Other Imaging Techniques : CT, SPECT, PET, Gamma camera.

Nuclear Medicine : Principle, Choice of radionuclide and radiopharmaceuticals, Technetium generator, Imaging and function test of thyroid gland, liver, spleen, kidney, lungs, brain heart and bone.

Radiation Therapy : Principles of radiation therapy, Radiotherapy treatment planning, Isodose curve, Simulator, Teletherapy, Co-60 unit, Linac.

Brachytherapy : Radioactive sources, Calibration of brachytherapy sources, Calculation of dose distribution, Systems of implant dosimetry, Coputer dosimetry, Implantation techniques.

Nuclear Analytical Techniques : Photon induced X-Ray emission(XRF), Particle induced X-ray emission, Proton induced gamma ray emission, Neutron proton activation analysis, Neutron capture prompt gamma-ray analysis, in-vitro and in-vivo nuclear activation analysis.

ooks Recommended :

Brown, B. H. and Smallwood, R H	: Medical Physics and Physiological Measurements
Cameron, J. R. and Skofronick, J.	: Medical Physics
Hende, W. R.	: Medical of Radiation Physics
Johns and Cunningham	: Physics of Radiology
Sprawls, P	: Physical Principles of Medical Imaging
Cesareo, R. et al.	: Nuclear Analytical Techniques in Medicine

17

M.Sc. (Final)—2

Subject Code-2780 : Practical (Group A) 1.0 Unit (100 Marks)

Examination duration : 12 hours (two days)

Total number of experiments to be performed *Four*, taking at least *One* from each group. All experiments should be of three hours duration.

Experiments (3 hours each)	$4 \times 20 = 80$
Laboratory note book	10
Viva-voce	10
	Total = 100

Marks for each experiment shall be distributed as follows.

a) Theory	3
b) Data collection	8
c) Calculation and results	6
d) Discussion	3
	Total = 20

Group A: Nuclear Physics

1. Determination of the efficiency of a G-M tube for beta counting (Y-Sr source).
2. Relative efficiency of a G-M tube for β-γ counting (Co or source).
3. Determination of the resolving time of G-M counter by the double source method (Two Cs source with slightly different strength).
4. To Study the random of radio active decay and show that the 68.3% to the measurements would fall within the limits bound by $\pm\sigma$ from the mean value of the measurements.
5. Determination of the binding energy of deuteron.

Group B: Solid State Physics

1. Investigate the current voltage characteristics of a base emitter and base-collector junction of a transistor and hence find the ohmic resistance of the element of the transistor.
2. Study the effect of temperature on the reverse saturation current of given p-n junction and hence find the intrinsic forbidden energy gap of the semiconductor specimen.
3. Measurement of junction capacitance of a p-n junction and determination of the depletion width.

20

72

, study the conductivity as a function of temperature in an intrinsic
miconductor.

etermination of Hall effect in a p-or n-type Si or Ge and to find out
e mobility of carriers.

nalysis the given x-ray powder photograph of a material and hence
d out the lattice spacing of the crystal.

p C: Electronics

onstruct a transistorized stabilized power supply and study its
:put characteristics.

nstruct a summing amplifier using a 741 OPAMP and show the
ming in tabular form for three different values of gain.

construct a single stage transistor amplifier and to find its
quency response curve

construct a JK or SR- flip-flop.

construct a half adder circuit using IC logic gates

construct a full adder.

Recommended :

mad. G. Uddin and Nasreen. Fatema	: Advanced Practical Physics
K. and Matin, M. A.	: A Text Book of Practical Physics
pping. J., Capman and Hall	: Errors of Observation and their Treatment
man, J. and Halkias, C.C.	: Electronic Devices and Circuit
nnan and Pramanik	: ব্যবহারিক পদার্থবিজ্ঞান ১ম ও ২য় খড
নুজামান	: সলিড স্টেট ফিজিক্স

bj.t Code- 2770 : Thesis (75 marks on thesis and 25 marks for
va voce on thesis) (Group-B)   0.75 Unit (75 Marks)

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21

73